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MONTHLY WEATHER REVIEW

JUNE 1940

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UNITED STATES DEPARTMENT OF AGRICULTURE

WEATHER BUREAU

WASHINGTON

1940

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MONTHLY WEATHER REVIEW

Editor, EDGAR W. WOOLARD

VOL. 68, No. 6
W. B. No. 1298

JUNE 1940

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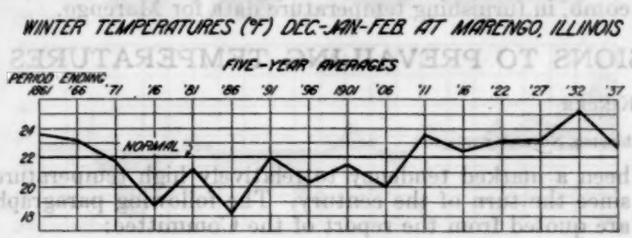
AN 80-YEAR TEMPERATURE RECORD

By CLARENCE J. ROOT

[Weather Bureau, Detroit, Mich., December 1939]

A number of temperature records in the United States cover periods of more than 75 years, but it is doubtful whether many, if any, include a period of 57 years by the same observer, on the same farm, and without the loss of a single month of record, as at Marengo, Ill.: In this vicinity, a weather record was begun in 1856. Nothing is known of the location or exposure during the first 4 years; but in 1860, John West James [1] began records and continued them until his last illness in 1917. The writer inspected this station and found the instruments to be properly exposed, and it is understood that they occupied the same location on the farm during the entire 57 years. It was in Riley Township, 3 miles south of Marengo, and was carried in the records under the name "Riley." In 1918 the station was moved to Marengo, to a place several acres in extent at the extreme south edge of the town.[2] It was practically a rural exposure. This location was maintained until June 1937.



Thus, there is afforded an opportunity to compare the temperatures of 76 winters (December–January–February), with only 2 exposures and 2 observers during the entire period. For convenience of discussion, the first 4 winters are included, giving a record of 80 years.

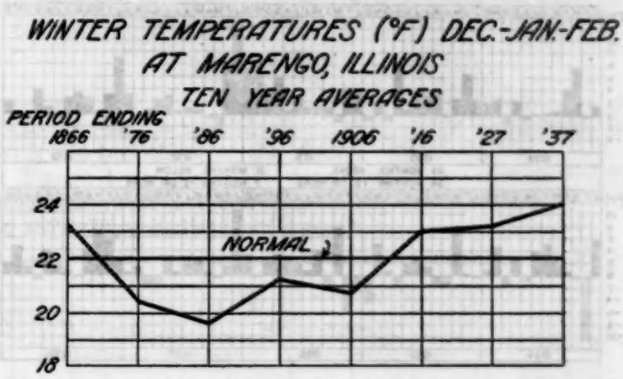
Winters are designated by the year in which January and February fell; thus the winter of 1857–58 is given as 1858. The average temperature of all 80 winters is 22.0°, and this value is termed a "normal."

Considering individual winters, it is found that at no time were there more than four consecutive ones above normal, except for the 6-year period from 1930 to 1935; 1936 was 7.4° below normal. Only twice were there more than four consecutive winters below normal, viz., 1833 to 1888, inclusive, and 1901 to 1904, inclusive. An interesting feature is the series of alternately warm and cold winters from 1873 to 1881, each being in sharp contrast with the previous one; to the nearest whole number, the departures from the normal during this series were −8°, 0°, −11°, +5°, −4°, +9°, −6°, +5°, −8°, +6°, and −8°. By decades the numbers of warm winters (more than 5° above normal) were: 2, 0, 2, 1, 0, 0, 2, and 2; and the numbers of cold winters (more than 5° below normal), 0, 2, 4, 3, 2, 0, 1, and 1. Of the 80 winters under discussion, the warmest were those of 1878 and 1932; other warm winters were 1858, 1863, 1890, 1918, 1920, and 1931. The coldest winter was that of 1874 (11.2°); other cold winters were 1873, 1881, 1883, 1885, 1893, 1904, and 1936.

Considering the winters by 5-year periods, the first two were above normal, passing normal on a downward curve at the 1871 pentad. They remained below normal through 1906, except that the pentad of 1891 was just normal. The coldest was that of 1886, 18.1°. Five-year averages from 1911 to 1937 were all above normal. The warmest was that of 1932, 25.2°, followed by a drop to 22.8° for the next and last pintad. It will be seen that winters grouped in 5-year averages were below normal from those of 1876 to 1906, inclusive, and above normal for those of 1861, 1866, and from 1911 to 1937, inclusive.

The Marengo winters have been averaged by decades also. That for 1866 was above normal, the next four below, and the last three above. The coldest 10-year period was the one ending in 1886, 19.6°; and the warmest, 1937, 24.0°.

In groups of 20 years the averages were 21.8°, 20.4°, 21.9°, and 23.6°, there being a rise of 3.2° from the second to the fourth. The average for the first 40 years was 21.1° as compared with 22.7° for the second 40 years, a rise of 1.6°.

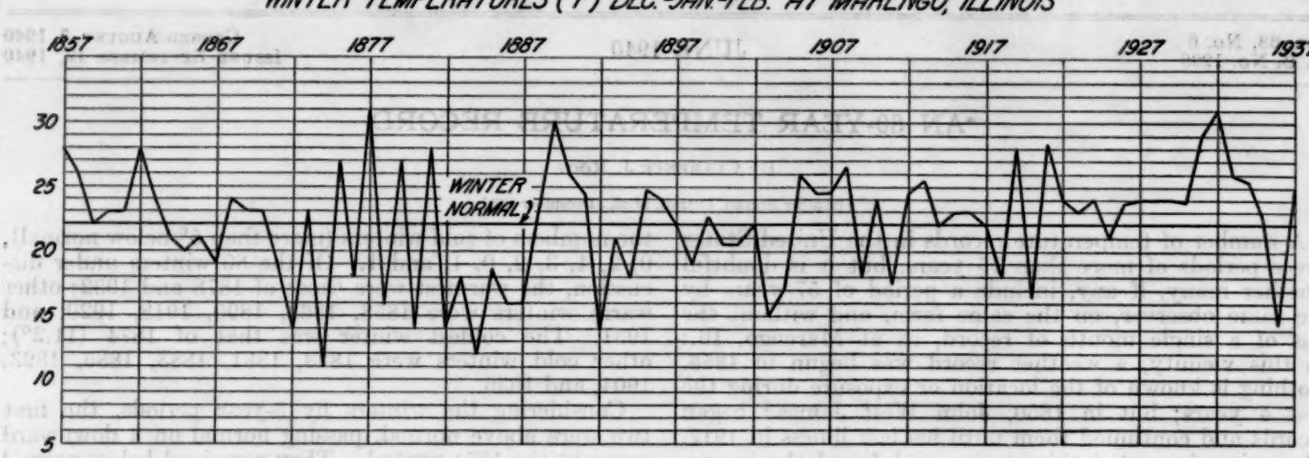


Eliminating the fluctuations of individual winters and using only pentads and decades, there was a definite cold period at Marengo from 1872 to 1905 and a warm period from 1906 to 1937.

It might be suggested that the tendency to milder during the last two decades could be due to the change of location, but the Marengo records for 6 years before the change and 6 years after have been compared with those at Walnut where it is known that the exposure was not

[1] Missouri Weather Review, Nov. 1930, 58: 451–453.
[2] Installation made by Charles L. Mitchell, U. S. Weather Bureau, now at Washington, D. C.

changed during that time. Marengo is consistently colder than Walnut, being farther north. From these comparisons, it is found that the average difference between Marengo and Walnut was greater after the change, rather than smaller. The amount of this greater difference was 0.6° for January, 0.2° for February, 0.8° for December, and 0.6° for the winter period. It appears then that this warmer tendency after 1917 was real, and not due to the change of location and exposure.



The writer desires to express appreciation of the kindness of the present Illinois section director, E. W. Holcomb, in furnishing temperature data for Marengo.

RELATION OF RECENT GLACIER RECESSIONS TO PREVAILING TEMPERATURES

By J. B. KINCER

[U. S. Weather Bureau, Washington, November 1939]

The 1939 volume of the Transactions of the American Geophysical Union contains a report by the Committee on Glaciers, François E. Matthes, chairman, on the fluctuations of glaciers, with particular reference to recent recessions. This report is of more than passing interest in connection with the now recognized occurrence of comparatively long-time temperature trends. There has been a marked tendency to relatively high temperatures since the turn of the century. The following paragraphs are quoted from the report of the Committee:

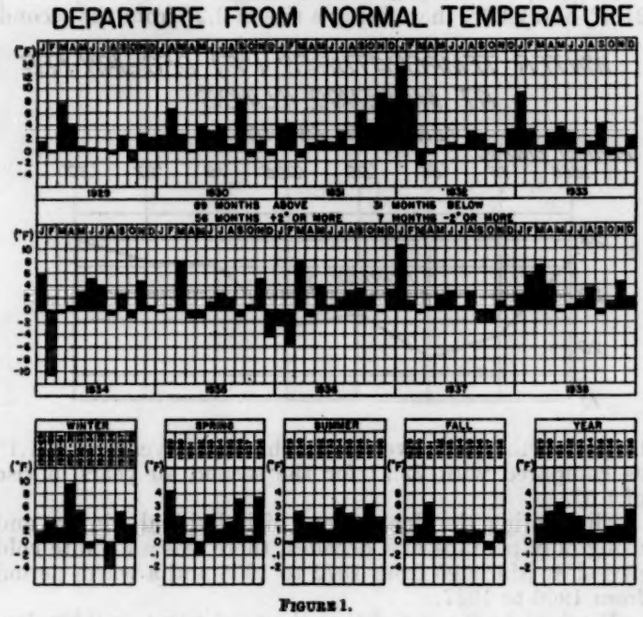


FIGURE 1.

The systematic measuring of glacier-oscillations from year to year has now been carried on in this country since 1931 (in one locality since 1918); in Europe it was inaugurated in 1894 and has been carried on continuously ever since, except for the unfortunate intermission that was caused by the World War. The value of the records obtained is not to be gaged by the variations indicated in any one year, or group of years, for such passing variations reflect merely the effects of short-time fluctuations in precipitation and temperature, and of various local factors as well. Taken collectively, however, in relation to long-time swings in climatic conditions comprising decades, centuries, and even thousands of years, they are found to possess great significance. That fact has long been recognized and, as a consequence, more than one glaciologist has been spurred on to search for data that would permit extension of the plotted curves back into historic times and even farther back into the past.

Successful searches made in the archives of the town of Chamonix, at the foot of the Mont Blanc Chain (Charles Rabot, Récents travaux glaciaires dans les Alpes françaises, La Géographie, v. 30, pp. 257–268, 1915), notably have served to extend the record for the glaciers of the French Alps back to 1580 and for the first time have made it clear that the general recession of those glaciers, which has been in progress during the last few decades, set in shortly after the middle of the nineteenth century. Previous to this there had been an epoch of relatively great glacier-extension that lasted, with minor fluctuations, about 250 years. The glaciers of the French Alps, therefore, are now merely receding back to the positions which they occupied toward the end of the sixteenth century.

More recently Thorarinsson, by searching old records in Iceland, has succeeded in tracing the history of glacier-oscillations on that island back to the year 875, when the Norsemen established their first colonies. This history, significantly, reveals that the present recession of the Iceland glaciers also began shortly after the middle of the nineteenth century (Sigurdur Thorarinsson, Grössenschwankungen der Gletscher in Island, Trans. Internat. Commissions of Snow and of Glaciers, Washington, 1939).

Doubtless it is no mere coincidence that recent observations by Munday on the great Klinaklini and Franklin glaciers in British Columbia, show that these glaciers also are receding from a maxi-

mum advance that must have occurred shortly after the middle of the nineteenth century. And the record of the Nisqually Glacier, on Mount Rainier, which reaches back to 1857, is of a closely similar nature. (W. A. Don Munday, The last advance of the glaciers in the Coast Mountains of British Columbia, Trans. Internat. Commissions of Snow and of Glaciers, Washington, 1939)

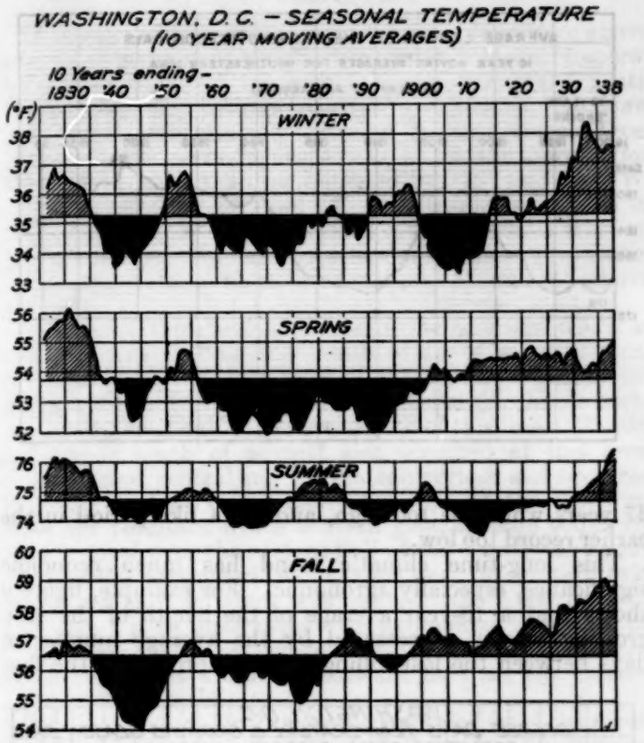


FIGURE 2.

Our longest weather records, extending back in some cases to the latter part of the eighteenth century, show conclusively that since about the middle of the nineteenth century, corresponding to the beginning of the current glacier recession indicated in the report, there has been a

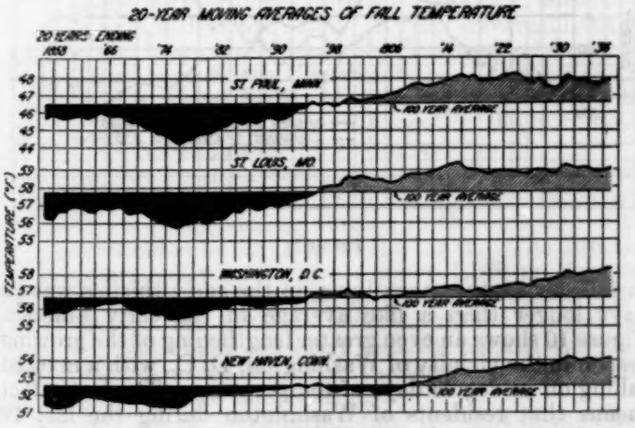


FIGURE 3.

marked tendency to higher temperatures than formerly, the upward trend being especially marked during the last few decades. These temperature trends are shown graphically in the accompanying illustrations.

Figure 1 shows for Washington, D. C., the departure of temperature from normal, month by month and season by season, for the decade 1929–38. For these 10 years, 75 percent of the 120 months had above normal temperature, 90 percent of the 40 seasons were warmer than normal, and for the year as a whole there was not a single minus departure of temperature.

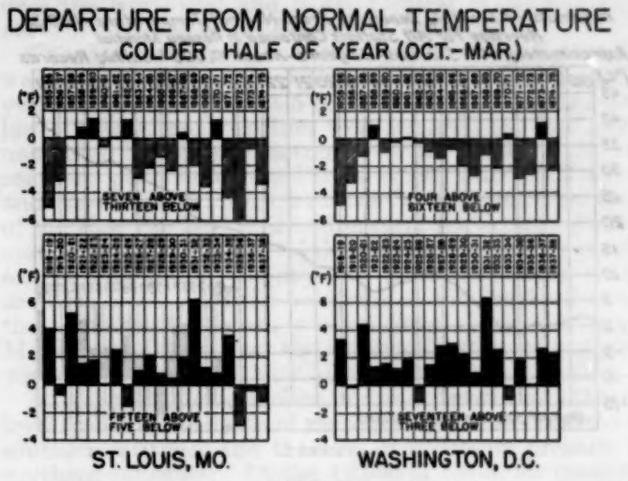


FIGURE 4.

Figure 2 shows seasonal trends for Washington by 10-year over-lapping, or moving, averages, the record covering about 120 years. The rise in temperature of the fall season has been especially marked, as shown in figure 3. As this graph represents a 20-year moving

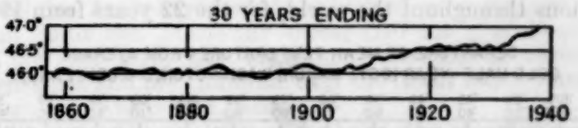


FIG. 1.—THE MARCH OF TEMPERATURE IN WEST EUROPE 1830–1938.

The 30 year moving average from the combined means at: Edinburgh, Oxford, Greenwich, De Bilt, Bergen, Oslo, Stockholm, Copenhagen, Wilno and Berlin.

FIGURE 5.

average, the data actually center 10 years before the dates shown, so that the beginning of the rise agrees well with the beginning of the glacier recessions.

Figure 4 compares the departures from normal for the cold half-year, October–March for the 20 years, 1855–56 to 1874–75, with the last 20 years.

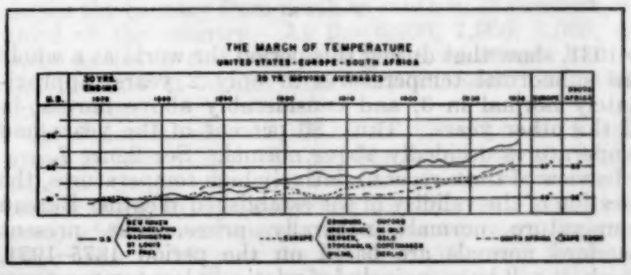


FIGURE 6.

Figure 5 is reproduced from "The Composition of the Atmosphere through the Ages," by G. S. Callendar, Imperial college of Science, London, England, published in the Meteorological Magazine for March 1939. It shows for Europe a recent general trend to higher temperatures, especially marked since the turn of the century in accord with findings in the Western Hemisphere.

For purposes of comparison we have also reproduced Callendar's graph in figure 6 and plotted in conjunction therewith a composite annual temperature curve for the United States, and another for a single station (Capetown) in South Africa. There is close agreement among these,

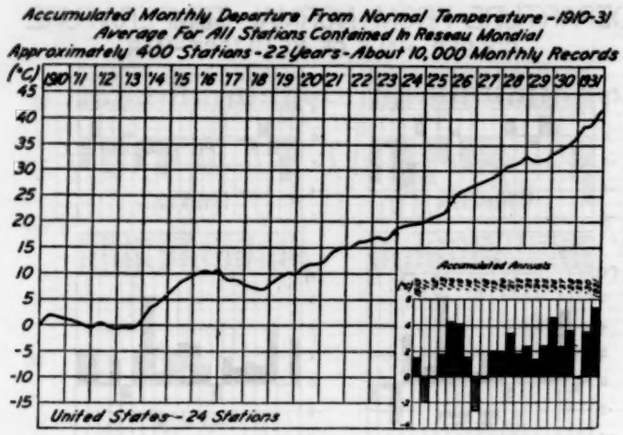

Accumulated Monthly Departure From Normal Temperature - 1910-31
Average For All Stations Contained In Reseau Mondial
Approximately 400 Stations - 22 Years - About 10,000 Monthly Records
(°C)
1910 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
45 40 35 30 25 20 15 10 5 0 -5 -10 -15
Accumulated Annuals
United States - 24 Stations

FIGURE 7.

but it will be noted that the rise has been more pronounced in the United States than in either Europe or South Africa.

There is further conclusive evidence that this trend to higher temperature has been general over the globe. Summaries of monthly records published in the Reseau Mondial, containing records for about 400 well distributed stations throughout the world, for the 22 years from 1910

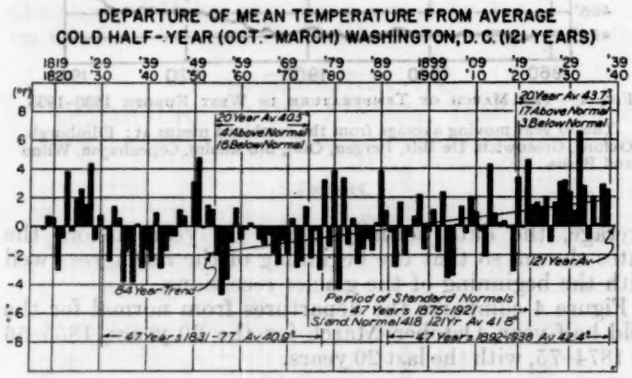

DEPARTURE OF MEAN TEMPERATURE FROM AVERAGE
COLD HALF-YEAR (OCT.-MARCH) WASHINGTON, D.C. (121 YEARS)
1819 1820 '29 '30 '39 '40 '49 '50 '59 '60 '69 '70 '79 '80 '89 '90 1899 1900 '09 '10 '19 '20 '29 '30 '39 '40
(°F)
8 6 4 2 0 -2 -4 -6 -8
20 Year Av. 43.7
17 Above Normal
3 Below Normal
20 Year Av. 40.3
4 Above Normal
16 Below Normal
64 Year Trend
121 Year Av.
Period of Standard Normals
47 Years 1875-1921
Stand. Normal 41.8 121 Yr. Av. 41.8°
47 Years 1831-77 Av. 40.0°
47 Years 1892-1938 Av. 42.4°

FIGURE 8.

to 1931, show that during this period the world as a whole had subnormal temperatures in only 2 years, approximately normal in 3, and considerably above normal in all the other years. Thus, 80 percent of the years had temperatures decidedly above normal. See figure 7.

In view of these recent relatively high temperatures, the question of the validity of the established Weather Bureau temperature normals naturally arises. The present standard normals are based on the period 1875–1921, which, it will be seen, includes relatively low temperatures in the first part of the period and relatively high in the latter; this fact is illustrated in figure 8 for the cold half-year of the Washington record, the entire record covering 122 years. The period included in the standard normals averages 41.8°, exactly the same as the average for the entire record. Therefore, the normal sample is representative. It is obvious that a normal computed from the last

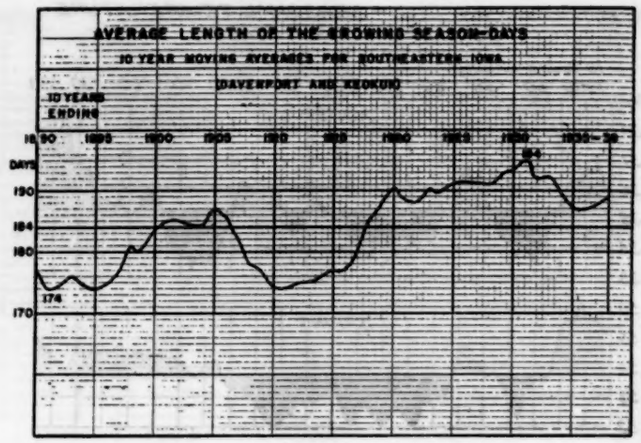

AVERAGE LENGTH OF THE GROWING SEASON-DAYS
10 YEAR MOVING AVERAGES FOR SOUTHEASTERN IOWA
(DAVENPORT AND KEOKUK)
10 YEARS ENDING
1890 1895 1900 1905 1910 1915 1920 1925 1930 1935-39
DAYS
190 184 180 174 170

FIGURE 9.

47 years would be too high, and for a like period in the earlier record too low.

This long-time climatic trend has much economic significance, especially agronomic. For example, figure 9 shows that a 10-year average of the length of the crop growing season, represented by the average number of days between the last killing frost in spring and the first

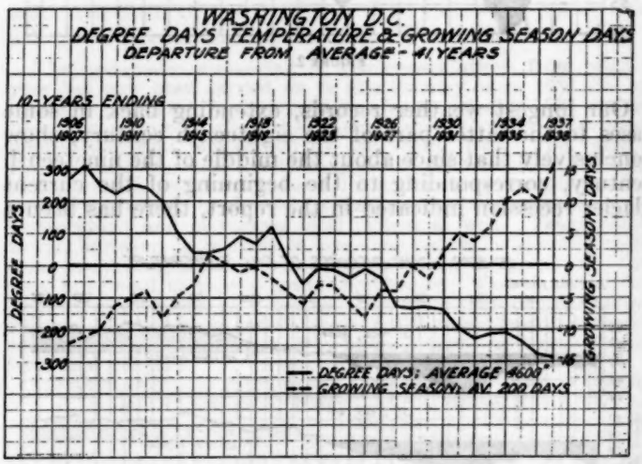

WASHINGTON, D.C.
DEGREE DAYS TEMPERATURE & GROWING SEASON DAYS
DEPARTURE FROM AVERAGE - 41 YEARS
10-YEARS ENDING
1906 1907 1910 1911 1914 1915 1918 1919 1922 1923 1926 1927 1930 1931 1934 1935 1937 1938
DEGREE DAYS
300 200 100 0 -100 -200 -300
GROWING SEASON - DAYS
15 10 5 0 -5 -10 -15
DEGREE DAYS: AVERAGE 4600°
GROWING SEASON: AV. 200 DAYS

FIGURE 10.

in fall, for southeastern Iowa, in the early thirties was 20 days longer than a like average in the early nineties. Figure 10 shows an even greater lengthening of the growing season in the vicinity of Washington, D. C., with a marked falling off in degree days of temperature. The latter fact means that residents of Washington during the last 10 years have required artificial heat in winter comparable to requirements in south-central Virginia some 40 years ago.

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR JUNE 1940

[Climate and Crop Weather Division, J. B. KINCER in charge]

AEROLOGICAL OBSERVATIONS

By EARL C. THOM

The mean surface temperatures during June were above normal over most of the United States. Mean temperatures subnormal for the month occurred over the South Central Region, over Southern New Mexico, the New England States and the extreme North Central Area. Temperatures were highest, relative to the normal for this month, over the area bounded by 110° and 123° W. longitude, and by 37° and 44° N. latitude; nearly all of this area being 6° above normal with an area in western Nevada and eastern California, including the city of Reno, recording mean surface temperatures 8° and 9° above normal.

At the 1,500 m. level direction of the resultant winds at 5 a. m. during June was south of the 5 a. m. normal (counterclockwise) over most of the country south of 40° N. latitude and was north of this normal (clockwise turning) over about half of the area north of this line. Resultant winds south of normal also occurred at this level over the west central and the plateau regions and occurred over the eastern Great Lakes region. At the 3,000 m. level the resultant winds were in general more southerly than normal over the eastern half of the country and were more to the northward than normal over the western half. The same shift in winds was noted at the 5,000 m. level when the 5 p. m. observations were compared to the 5 a. m. normal for that level except that the northward turning of the resultant extended eastward over all the Central and South Central States.

At the 1,500 m. level the resultant velocity of the winds at 5 a. m. during June was above the corresponding normal over the eastern third of the country, with the largest positive departures (3.0 to 3.5 m. p. s.) over the Lake States and over New England, and was also slightly above normal along the northern half of the Pacific coast. The resultant velocity was below normal at this level over the rest of the country. At the 3,000 m. level the resultant velocity at 5 a. m. was above normal over most of the eastern and northern one-third of the country, amounting to 3.8 m. p. s. at Detroit, Mich. At this level resultant velocities were below normal over the Southwest and over the East Central and South Central States. At the 5,000 m. level the 5 p. m. resultant velocities were higher than the corresponding 5 a. m. normals except in the Southwest, where the opposite departures occurred.

The departure of surface temperatures from the normals for the month appears to have been in general accompanied by a corresponding turning in the direction of the resultant wind at levels 1,500 m. and lower. The direction of the resultant wind at levels above 1,500 m. does not appear to directly affect the surface temperatures. It is noted that at the 1,500 m. level the resultant winds are from directions more southerly than the normal over most of the area in which are noted the largest positive departures of the surface temperatures.

At the 1,500 m. level during June the shift in the direction of the resultant wind from 5 a. m. to 5 p. m. was counterclockwise over most of the country. The opposite change occurred over an area along the central and eastern Gulf of Mexico and over a strip including part of the North Central States, the plateau region, New Mexico, and extreme west Texas. At the 3,000 m. level, however, the clockwise shift in resultant direction between 5 a. m. and 5 p. m. extended over most of the country, the opposite wind shift being noted only over the extreme Northeast, over the Northwest and North Central States and over parts of Arizona, New Mexico and Texas.

The changes in resultant velocity from 5 a. m. to 5 p. m. were well divided at the 1,500 m. level, about half of the velocities being higher at 5 p. m. than at 5 a. m. and half lower. Resultant velocities were lower in the late afternoon than in the early morning over the northern and the southern portions of the Pacific coast, over the Central and West Coastal States, over the Great Lakes, over most of the New England area and most of the extreme Southeast. At the 3,000 m. level there was an increase in resultant velocity during the day over about two-thirds of the country, lower velocities occurring at this level only over the extreme Northeast, over a strip along the upper Mississippi Valley, over the extreme Northwest and over portions of Colorado, New Mexico, and Texas.

At all levels above surface, up to at least the 17,000 m. level (table 1), the area of maximum pressure occurred at southern latitudes and the area of minimum pressure at northern latitudes. At the 12,000 m. level, for example, the pressure over Miami was 214 mb., the pressure over Sault Ste. Marie was 201 mb., while still further north in Alaska the pressure at this level was 193 mb. over both Fairbanks and Juneau. At each of the 1,000 m. levels from 8,000 to 15,000 m. inclusive, Miami had the highest pressure shown at any station in the United States, and Sault Ste. Marie the lowest pressure. At the 16,000 m. level San Antonio recorded the highest pressure (112 mb.) and Sault Ste. Marie the lowest (107 mb.), while at the 17,000 m. level the maximum pressure occurred at Pensacola and the minimum over the Great Lakes stations, Sault Ste. Marie and Joliet.

At the 3,000 m. level and above, the mean pressures were higher in June than in May. In some areas this increase in pressure at certain levels was considerable, for example, at the 10,000 m. level the pressures were from 10 to 12 mb. higher in June than in May in the central and east central portions of the country. At levels below 3,000 m. the number of cases in which the June mean pressure was higher than the pressure in May gets larger until at the surface the number of such cases of increases in pressure about equals the number of cases of decreases.

The steepest gradient in mean pressure values occurred across the country from north to south in the eastern one-third of the country. At the 6,000, 7,000, 8,000, and 9,000 m. levels there was a difference of 16 mb. between the pressure at Miami and that at Sault Ste. Marie during June.

At all levels below 12,000 m. the mean free-air temperatures in June over the United States and over the Middle Atlantic Ocean were higher than were the corresponding temperatures in the preceeding month. In Alaska, however, while the temperatures at Juneau were higher in June than in May at the 9,000, 10,000, and 11,000 m. levels, the temperature at Fairbanks had increased in the same period at the 9,000 m. level but had decreased at the 10,000 and 11,000 m. levels. The mean free-air temperatures for June were higher than in May over Juneau and over most of the western half of the country at each of the next three higher 1,000 m. levels. At Fairbanks temperatures were lower at these levels. The free-air temperatures over Joliet were colder than in May at these three

levels, 0.5° colder at 12,000 m., 3.5° colder at 13,000 m. and 8.3° colder at 14,000 m., while at Minneapolis, Sault Ste. Marie, and at St. Louis, temperatures were lower than in May at the higher two of these three levels. At four other stations in the eastern half of the United States and at the Atlantic station No. 1, the mean free-air temperature was colder than in May at the 14,000 m. level. The mean free-air temperatures at all stations in the United States were colder in June than in May at the next four higher 1,000 m. levels. At the two Alaska stations and at the Atlantic station No. 2 the temperatures were warmer than in May at these four levels.

At the 1,000 m. and the 2,000 m. levels mean free-air temperatures were higher in June of this year than in June 1939 over the western one-third of the United States and over the northern half of the Central States, and were lower over the eastern one-third of the country and over the southern half of the Central States. At the 3,000, 4,000 and 5,000 m. levels the mean free-air temperatures for June this year were also higher than last year over the western one-third of the United States and over the northern half of the Central States except at San Diego where the temperatures were lower at the upper two of these levels. Temperatures were lower over the eastern third of the country and over the southern half of the Central States except at Oklahoma City and El Paso where it was warmer than last year at the 5,000 m. level. At still higher levels no well defined change from the temperatures of last year was evident.

The altitude of the level of mean freezing temperature was higher over the plateau than over the Eastern States at corresponding latitudes. The altitude of this level of mean 0° C. temperature was about 3,100 m. at Sault Ste Marie, 4,000 m. at Joliet, 4,400 m. at Atlanta, 4,600 m. at Miami, 4,600 m. at Denver, 4,900 m. at Phoenix, 3,500 m. at Seattle, and 4,400 m., at Boise. The altitude of the average freezing level was higher in June than in May, being about 1,000 higher over that part of the country north of 45° N. Latitude and about 500 m. higher over the area south of 35° N.

The coldest recorded free-air temperature in June (not shown on table I) was −79.2° C. (−110.6° F.) which occurred near the 15,000 m. level over Miami. The absolute minimum temperatures were higher to the northward, the absolute minimum during the month for that part of the United States lying between 30° and 40° N. latitude being −77.4° C. (−107.3° F.) at Charleston near the 16,000 m. level while for the area north of 40° the corresponding minimum, −72.9° C. (−99.2° F.) occurred at Lakehurst, near the 15,000 m. level. In Alaska the absolute minimum for the month at Fairbanks was −60.4° C. (−83.9° F.) near the 11,000 m. level and at Juneau was −59.8° C. (−75.6° F.) near the 12,000 m. level.

Tropopause data for June showing the mean altitudes and temperatures of the tropopause at various stations is shown in table 4 and on chart XIII.

Table 3 shows the maximum free-air wind velocities and their directions for various sections of the United States during June, as determined by pilot-balloon observations. The extreme maximum for the month was 63 m. p. s. (141 m. p. h.) reported on June 15 from the W. over Sault Ste. Marie at a height of 10,650 meters (over 6½ miles) above sea level. This extreme free-air velocity was, however, 10 m. p. s. lower than the corresponding extreme for June in 1939.

MEAN ISENTROPIC CHART [1]

The dominant feature on the mean isentropic chart for June 1940 (θ=312° A.) was the large anticyclonic eddy which prevailed over the Gulf of Mexico and the Gulf States. Of less significance was the smaller anticyclonic system over the central part of the country.

A comparison with the precipitation chart reveals that the more westerly anticyclonic eddy did not produce extensive departures from normal; evidently the low relative humidities necessitated too much lifting for excess rain. Also, there is no apparent relation between the excess precipitation west of the lakes and the flow pattern in the 312° A. isentropic chart.

However, the moist tongue, which was present over the western Gulf States, did produce excess precipitation in some areas, while the occasional deficits along the Gulf coast were probably caused by invasions of the dry air.

CORRECTION IN PREVIOUSLY PUBLISHED DATA

Pressures shown in Table 1, May 1940, for Atlantic station No. 2 for the levels from 12,000 m. to 20,000 m., inclusive, were in error and should be corrected to read: 201 mb., 171 mb., 145 mb., 123 mb., 105 mb., 89 mb., 76 mb., 64 mb., and 55 mb., respectively, for these levels.

All temperatures shown in table 4 for the months of March, April and May 1940 should be negative instead of positive as printed.

[1] Prepared by the Research Division.

TABLE 1.—*Mean free-air barometric pressure (P.) in millibars, temperature (T.) in degrees Centigrade, and relative humidities (R. H.) in percent, obtained by airplanes and radiosondes during June 1940*

Altitude (meters) m. s. l.	Albuquerque, N. Mex. (1,620 m.)				Atlanta, Ga. (300 m.)				Billings, Mont. (1,089 m.)				Bismarck, N. Dak. (505 m.)				Boise, Idaho (864 m.)				Buffalo, N. Y. (220 m.)				Charleston, S. C. (14 m.)			
	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.
Surface	30	838	21.2	40	30	982	21.6	81	30	890	17.7	56	30	954	15.3	71	30	914	19.1	40	30	987	15.5	84	30	1,015	23.0	92
500					30	959	21.8	74													30	955	16.3	71	30	960	22.6	72
1,000					30	906	19.7	73					30	900	17.5	57	30	900	23.0	36	30	900	14.3	71	30	906	20.2	68
1,500					30	855	16.6	75	30	849	17.7	50	30	849	15.3	55	30	850	21.6	30	30	848	11.2	72	30	855	17.0	66
2,000	30	802	20.6	41	30	806	13.4	74	30	800	14.8	50	30	800	12.8	53	30	802	17.8	30	30	798	8.3	69	30	806	13.9	61
2,500	30	756	17.6	41	30	759	10.5	70	30	754	11.4	51	30	753	9.7	54	30	755	13.8	32	30	752	5.6	64	30	759	11.2	57
3,000	30	713	13.9	42	30	714	7.6	66	30	710	7.9	53	30	709	6.2	55	30	711	10.0	33	30	706	2.9	60	30	715	8.5	57
4,000	29	632	6.3	47	29	632	1.9	62	29	628	1.0	55	29	627	0.0	50	29	630	3.3	33	29	624	−2.0	54	30	633	3.0	55
5,000	29	559	−1.6	52	29	558	−3.4	60	29	554	−6.3	55	29	552	−6.1	45	29	556	−4.0	31	29	550	−7.7	49	30	559	−2.6	52
6,000	29	492	−8.8	54	29	491	−9.0	58	29	486	−13.5	54	29	486	−12.4	43	29	489	−11.0	33	29	483	−13.8	45	30	492	−8.3	46
7,000	29	432	−15.7	54	28	431	−15.7	54	29	426	−20.7	50	28	425	−19.6	40	28	429	−17.9	34	29	422	−20.6	41	30	432	−14.5	43
8,000	29	378	−23.3	52	27	377	−22.6	54	28	371	−28.3	48	28	371	−27.4	37	28	374	−25.7	34	28	368	−28.0	40	30	378	−21.4	41
9,000	29	328	−30.9	51	27	328	−30.0	52	28	322	−36.6	49	27	322	−35.5	36	27	325	−33.9	34	26	319	−35.6	39	30	329	−28.8	40
10,000	29	285	−39.1	50	27	284	−37.8	51	28	278	−44.7	----	24	278	−43.3	----	27	281	−41.8	----	26	276	−42.4	----	30	286	−36.6	44
11,000	29	246	−47.1	----	26	245	−45.7	----	28	239	−51.9	----	23	239	−50.7	----	26	242	−49.0	----	25	238	−48.0	----	30	246	−44.9	----
12,000	28	211	−54.4	----	26	211	−53.1	----	28	204	−56.6	----	21	204	−56.3	----	26	208	−54.8	----	24	204	−53.2	----	29	212	−52.3	----
13,000	28	180	−58.9	----	26	180	−59.3	----	26	174	−58.9	----	21	174	−58.4	----	26	178	−56.5	----	23	174	−57.6	----	29	181	−58.7	----
14,000	28	154	−61.2	----	25	153	−64.0	----	25	149	−59.7	----	19	148	−57.8	----	25	151	−57.7	----	23	148	−60.0	----	29	154	−63.7	----
15,000	28	131	−63.0	----	24	130	−67.2	----	23	126	−60.1	----	18	126	−57.5	----	25	129	−58.9	----	21	126	−60.2	----	29	131	−67.0	----
16,000	28	111	−64.2	----	24	110	−69.1	----	20	108	−60.5	----	17	108	−58.3	----	25	110	−59.7	----	19	108	−60.1	----	27	111	−68.6	----
17,000	27	94	−64.5	----	23	93	−69.3	----	16	92	−60.5	----	17	92	−58.0	----	23	94	−59.7	----	17	92	−60.4	----	26	94	−67.8	----
18,000	26	80	−64.4	----	23	79	−67.8	----	15	78	−59.2	----	13	78	−57.0	----	18	80	−59.3	----	12	78	−59.5	----	26	79	−66.4	----
19,000	21	68	−62.8	----	19	67	−64.8	----	13	66	−57.8	----	11	67	−56.2	----	11	68	−57.9	----	10	66	−57.8	----	18	67	−63.6	----
20,000	11	57	−60.6	----	12	57	−61.8	----					6	56	−54.9	----					6	55	−56.9	----	16	57	−61.0	----
21,000	5	49	−58.7	----																	6	48	−55.4	----	8	49	−59.6	----
22,000																					5	41	−54.7	----	5	41	−58.5	----

Altitude (meters) m. s. l.	Denver, Colo. (1,616 m.)				El Paso, Tex. (1,193 m.)				Ely, Nev. (1,908 m.)				Fairbanks, Alaska (153 m.)				Joliet, Ill. (178 m.)				Juneau, Alaska (49 m.)			
	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.
Surface	29	839	17.3	51	30	880	23.8	40	30	810	14.8	32	30	991	17.6	54	29	992	17.0	83	30	1,010	12.0	77
500													30	952	15.3	52	29	956	19.5	68	30	957	9.3	77
1,000													30	897	11.6	54	29	901	17.0	70	30	901	5.8	79
1,500					30	850	23.5	40					30	844	7.4	60	29	850	13.6	73	30	847	2.2	83
2,000	28	802	18.2	45	30	802	20.6	40	30	801	17.9	29	30	794	3.5	66	29	800	10.4	77	29	796	−1.2	85
2,500	28	756	15.6	44	30	757	16.9	42	30	756	17.4	29	29	747	−0.1	71	29	754	8.0	73	29	747	−4.1	83
3,000	28	712	12.3	44	30	713	13.3	45	30	712	13.5	29	29	701	−3.9	75	29	709	5.3	66	28	701	−6.5	77
4,000	28	631	5.1	50	30	633	5.6	50	30	631	5.5	31	29	617	−10.4	71	28	627	0.1	52	28	616	−11.8	67
5,000	28	558	−2.2	48	30	559	−1.5	49	30	558	−2.7	33	29	541	−17.0	67	28	553	−5.7	48	27	540	−18.1	61
6,000	28	491	−9.6	50	29	492	−8.9	50	30	491	−10.2	34	29	472	−24.1	65	28	486	−11.7	45	27	472	−25.2	60
7,000	28	431	−16.7	49	29	432	−15.5	46	30	431	−17.6	35	29	411	−32.4	64	25	426	−18.8	49	27	410	−32.8	60
8,000	28	376	−24.0	47	29	378	−22.5	44	30	376	−25.5	33	29	356	−40.0	----	24	372	−26.2	42	25	355	−40.3	----
9,000	27	327	−31.8	47	29	329	−30.1	42	30	326	−33.8	32	29	307	−47.6	----	23	323	−33.6	42	24	306	−47.3	----
10,000	27	283	−39.5	45	28	285	−38.2	----	30	282	−41.8	----	28	263	−53.9	----	23	279	−41.3	----	23	262	−51.9	----
11,000	27	244	−47.3	----	28	246	−46.6	----	30	243	−48.9	----	28	226	−55.2	----	22	241	−49.1	----	21	225	−50.4	----
12,000	26	210	−53.9	----	28	212	−54.0	----	30	208	−54.8	----	28	193	−50.5	----	22	206	−55.8	----	19	193	−47.6	----
13,000	26	179	−58.2	----	28	180	−59.4	----	29	178	−58.5	----	28	165	−47.7	----	22	176	−60.7	----	19	166	−46.6	----
14,000	25	152	−60.6	----	28	154	−62.6	----	28	152	−60.3	----	26	142	−46.9	----	21	150	−63.3	----	18	142	−46.3	----
15,000	21	130	−61.8	----	28	130	−64.9	----	27	129	−61.5	----	26	122	−46.6	----	20	127	−63.5	----	17	122	−46.5	----
16,000	20	110	−62.7	----	28	111	−67.0	----	27	110	−62.6	----	26	105	−46.4	----	19	108	−63.2	----	14	105	−46.8	----
17,000	20	93	−63.0	----	27	94	−67.8	----	27	94	−62.8	----	25	90	−46.2	----	16	91	−62.8	----	13	90	−46.8	----
18,000	16	79	−61.4	----	20	79	−66.5	----	21	80	−61.5	----	23	78	−45.8	----	13	78	−61.7	----	12	78	−46.8	----
19,000	8	67	−60.5	----	12	67	−64.5	----	15	68	−59.7	----	21	67	−45.4	----	11	66	−60.2	----	6	67	−46.8	----
20,000	7	56	−59.1	----									12	57	−45.2	----	6	56	−58.4	----				
21,000													6	44	−44.9	----								

Altitude (meters) m. s. l.	Lakehurst, N. J.[1] (39 m.)				Medford, Oreg. (401 m.)				Miami, Fla. (4 m.)				Minneapolis, Minn. (263 m.)				Nashville, Tenn. (180 m.)				Norfolk, Va.[1 2] (10 m.)				Oakland, Cal. (2 m.)			
	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.
Surface	30	1,009	15.5	88	30	968	19.7	50	30	1,017	24.5	90	29	981	18.3	74	30	994	21.2	81	29	1,016	21.9	79	29	1,013	14.7	82
500	30	956	16.9	61	30	957	20.2	48	30	961	23.1	83	29	954	18.8	66	30	958	21.6	71	29	960	21.4	61	29	956	15.5	74
1,000	30	902	15.0	58	30	902	18.5	46	30	908	20.7	74	29	900	16.6	62	30	905	19.2	68	28	906	19.0	59	29	901	20.7	43
1,500	30	850	12.3	58	30	851	15.5	48	30	856	18.0	67	29	849	13.4	64	30	854	16.1	69	28	854	15.4	62	29	851	19.5	36
2,000	30	800	9.5	55	30	802	13.2	47	30	807	15.3	63	29	800	10.8	62	30	805	13.4	69	27	805	11.6	63	29	802	16.8	32
2,500	30	753	6.8	52	30	755	11.6	41	30	761	12.7	59	29	752	8.2	57	30	758	10.6	68	27	758	8.4	61	29	756	13.8	28
3,000	30	708	4.5	49	30	711	9.0	40	30	717	10.0	57	29	708	5.4	52	30	714	8.1	65	27	714	5.2	60	29	712	10.6	25
4,000	29	625	−0.5	43	30	630	2.8	36	30	635	3.8	54	27	626	−0.1	49	30	632	2.7	59	26	631	−0.2	49	29	631	4.0	23
5,000	29	550	−6.1	42	29	556	−3.9	36	29	561	−1.8	52	26	552	−6.0	45	29	558	−3.0	53	22	556	−5.7	40	29	557	−2.9	23
6,000	29	484	−12.0	40	29	489	−10.4	37	29	494	−7.3	51	25	485	−12.4	43	29	491	−8.7	48					29	490	−9.5	20
7,000	29	424	−18.4	45	29	429	−17.8	36	27	434	−13.1	52	23	425	−19.3	41	29	431	−15.2	47					29	430	−16.9	19
8,000	29	370	−25.6	44	29	374	−25.9	35	26	380	−19.8	53	23	371	−27.0	38	29	378	−22.3	47					29	376	−24.8	19
9,000	29	323	−33.1	46	29	324	−34.1	35	25	331	−27.3	51	18	322	−34.7	37	29	328	−29.9	47					29	326	−32.9	19
10,000	28	278	−40.0	33	29	281	−42.2	----	25	287	−35.1	51	17	279	−42.2	----	29	284	−37.7	48					29	283	−40.6	----
11,000	27	240	−47.0	----	28	242	−49.4	----	25	249	−42.9	----	16	240	−49.1	----	29	245	−45.4	----					27	244	−48.0	----
12,000	26	206	−53.8	----	28	207	−55.3	----	25	214	−50.9	----	13	206	−54.9	----	29	211	−52.1	----					27	209	−54.6	----
13,000	25	176	−59.0	----	27	177	−59.4	----	24	183	−58.4	----	12	176	−59.4	----	29	180	−57.7	----					27	178	−58.8	----
14,000	24	150	−62.0	----	27	150	−60.3	----	24	156	−64.7	----	11	149	−60.4	----	29	154	−62.6	----					27	152	−60.8	----
15,000	22	128	−60.4	----	25	128	−61.6	----	23	132	−69.6	----	11	127	−59.4	----	29	130	−64.6	----					26	129	−62.5	----
16,000	19	109	−60.1	----	20	109	−62.1	----	23	111	−71.5	----	10	108	−59.1	----	29	111	−65.4	----					26	110	−63.5	----
17,000	16	92	−59.1	----	20	92	−61.9	----	23	94	−71.6	----	9	92	−58.6	----	29	94	−65.6	----					26	93	−63.5	----
18,000	13	78	−57.5	----	18	78	−60.9	----	23	79	−68.8	----	6	78	−58.0	----	28	79	−64.7	----					23	79	−62.5	----
19,000	12	66	−55.5	----	13	66	−60.1	----	18	67	−65.9	----	5	66	−57.7	----	25	68	−63.0	----					18	67	−61.2	----
20,000	6	56	−52.9	----	6	56	−58.1	----	9	57	−62.3	----					25	57	−60.3	----					11	57	−59.1	----
21,000	5	48	−50.3	----													12	49	−57.8	----					6	48	−57.3	----
22,000																	7	42	−55.6	----								

See footnotes at end of table.

TABLE 1.—*Mean free-air barometric pressure (P.) in millibars, temperature (T.) in degrees Centigrade, and relative humidities (R. H.) in percent, obtained by airplanes and radiosondes during June 1940*—Continued

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																							
	Oklahoma City, (391 m)				Omaha, Neb. (301 m)				Pearl Harbor, T. H.[1] [2] (6 m)				Pensacola, Fla.[1] (24 m)				Phoenix, Ariz. (339 m)				Portland, Maine (19 m)				St. Louis, Mo. (171 m)			
	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.
Surface	30	968	20.9	78	30	978	21.0	69	30	1,015	23.1	83	30	1,014	24.9	82	30	968	29.4	26	30	1,010	12.8	86	30	994	21.8	74
500	30	956	21.6	71	30	956	21.1	64	30	960	21.5	78	30	960	22.4	73	30	951	32.0	24	30	954	14.5	76	30	957	22.3	66
1,000	30	903	20.5	65	30	902	19.1	60	30	906	18.1	80	30	906	19.4	68	30	899	30.4	22	30	900	12.6	74	30	903	19.5	67
1,500	30	852	18.0	64	40	851	16.4	61	30	854	15.2	81	30	855	16.3	66	30	850	27.0	22	30	848	10.3	73	30	852	16.2	72
2,000	30	803	15.3	61	30	802	14.0	61	30	805	13.2	70	30	806	13.6	61	30	803	23.1	24	30	798	7.7	73	30	803	13.4	72
2,500	30	757	12.4	61	30	756	11.3	59	30	759	12.8	45	30	759	10.9	54	30	757	18.9	26	30	751	5.4	69	30	757	11.1	64
3,000	30	713	9.4	58	30	712	8.5	55	30	715	11.9	28	30	715	8.2	52	30	714	15.1	28	30	706	3.0	65	30	712	8.4	60
4,000	30	631	3.1	58	30	630	2.3	52	30	634	7.2	19	30	633	2.5	44	30	634	7.4	31	30	624	−2.7	61	30	631	2.7	55
5,000	30	558	−3.4	57	30	556	−4.2	48					30	559	−3.1	42	30	560	−0.2	35	30	549	−8.2	57	30	557	−3.6	53
6,000	30	491	−9.5	51	29	489	−10.7	46					30	492	−8.6	42	30	494	−7.8	36	29	482	−14.5	50	30	490	−9.6	53
7,000	30	430	−16.2	47	28	429	−17.3	40					29	432	−15.1	40	30	434	−15.1	36	29	422	−21.2	47	30	430	−16.1	50
8,000	30	376	−23.2	46	28	375	−24.1	39					25	377	−22.2	39	30	379	−22.8	34	29	366	−28.5	44	30	376	−23.2	48
9,000	30	327	−31.0	45	27	326	−31.8	38					25	328	−29.4	42	29	330	−30.9	33	29	318	−35.9	43	30	327	−30.8	46
10,000	30	284	−38.9	44	26	283	−39.4	38					25	285	−36.9	41	29	286	−38.8	32	29	275	−42.5		29	283	−38.7	47
11,000	30	244	−46.6		25	244	−46.8						24	246	−44.5		28	247	−46.4		29	237	−48.5		28	244	−46.4	
12,000	30	210	−54.0		25	209	−53.5						16	212	−52.2		28	212	−52.9		29	203	−53.6		27	210	−53.2	
13,000	26	179	−59.7		25	179	−59.0						16	181	−59.3		27	181	−57.5		28	174	−57.4		27	179	−58.8	
14,000	26	152	−63.0		25	152	−61.6						15	154	−64.3		25	154	−60.7		28	148	−59.0		27	152	−61.5	
15,000	25	129	−64.2		24	130	−60.7						12	131	−67.1		23	131	−63.3		28	126	−59.1		26	129	−62.7	
16,000	22	110	−65.3		24	110	−60.9						9	111	−68.7		22	111	−65.6		27	108	−59.1		25	110	−63.2	
17,000	21	93	−65.8		22	94	−61.2						6	95	−69.2		19	94	−66.4		25	92	−58.8		25	94	−63.2	
18,000	16	78	−64.5		22	80	−60.5						6	80	−68.9		16	80	−66.4		20	78	−57.9		20	79	−62.3	
19,000	15	67	−62.1		20	68	−59.0						5	68	−66.6		13	68	−63.9		13	67	−56.6		19	67	−60.3	
20,000	5	56	−58.9		9	58	−57.0										7	57	−61.3		7	57	−54.5		16	57	−58.5	
21,000																									10	49	−56.4	

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																							
	San Antonio, Tex. (174 m.)				San Diego, Calif.[1] (19 m.)				S. S. Marie, Mich. (221 m.)				Seattle, Wash.[1] (27 m.)				Spokane, Wash. (508 m.)				Washington, D. C.[1] (7 m.)			
	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.
Surface	30	993	23.4	80	29	1,010	16.8	84	30	984	10.8	87	25	1,015	15.3	68	29	944	18.6	46	30	1,014	19.7	81
500	30	957	22.5	77	29	954	13.9	81	30	952	12.4	78	25	960	14.3	53					30	957	19.1	64
1,000	30	903	20.8	73	29	900	18.9	46	30	897	12.1	71	24	905	12.7	49	29	901	19.5	40	30	903	17.0	62
1,500	30	853	18.4	69	29	849	19.9	25	20	845	9.6	70	24	852	9.7	53	29	850	16.2	38	30	851	14.3	63
2,000	30	804	15.8	67	29	801	18.3	25	30	795	6.7	71	24	802	6.7	55	29	801	12.2	40	30	802	11.3	64
2,500	30	758	13.1	65	29	755	16.0	25	30	748	3.7	70	24	754	4.3	49	29	754	8.3	43	30	755	8.6	61
3,000	30	714	10.6	60	28	712	12.7	26	30	703	1.0	67	34	709	2.5	40	29	709	4.6	44	30	711	5.9	62
4,000	30	632	4.6	57	27	631	5.2	24	30	620	−4.6	65	24	626	−2.4	40	29	627	−1.4	43	30	628	0.6	56
5,000	29	559	−1.7	56	26	558	−2.2	21	30	546	−10.5	57	24	551	−8.2	43	28	552	−7.7	41	30	554	−4.7	54
6,000	29	492	−8.0	54	25	491	−9.5	27	30	478	−16.9	54	24	483	−15.0	52	28	485	−14.3	42	29	487	−10.5	54
7,000	29	432	−14.6	51	23	431	−17.4	35	30	418	−23.7	51	24	423	−21.9	59	28	424	−21.3	43	29	427	−16.6	54
8,000	28	378	−21.9	47	22	376	−25.4		30	364	−30.6	48	23	368	−29.2	66	28	369	−29.0	44	19	373	−23.6	55
9,000	28	329	−29.3	46	22	327	−33.1		30	315	−37.7	46	20	320	−36.5	61	28	320	−36.9	44	19	324	−31.0	50
10,000	26	286	−36.9	46	22	283	−40.9		30	272	−44.1		18	276	−43.8		28	277	−44.8		18	281	−36.6	48
11,000	26	246	−44.7		21	244	−47.9		28	234	−49.7		14	238	−50.5		27	238	−51.9		16	243	−42.4	
12,000	26	212	−51.8		21	209	−54.3		28	201	−54.6		11	204	−55.1		26	204	−56.1		12	208	−49.0	
13,000	24	181	−57.5		19	179	−59.4		27	171	−57.3		9	175	−57.0		25	174	−56.6		9	178	−53.9	
14,000	23	154	−61.9		17	152	−62.9		26	146	−57.3		9	149	−59.0		23	148	−56.4		7	152	−57.6	
15,000	23	131	−64.5		16	129	−65.0		23	125	−57.4		6	128	−60.4		23	127	−57.1		6	129	−59.6	
16,000	23	112	−66.4		15	110	−66.6		19	107	−57.5		6	109	−61.5		22	108	−57.5					
17,000	22	94	−67.1		14	94	−67.0		15	91	−57.3		5	93	−61.4		18	92	−57.2					
18,000	21	80	−66.1		13	80	−65.9		13	78	−56.4						17	78	−56.5					
19,000	17	68	−63.9		12	68	−64.3		5	66	−55.1						12	67	−55.1					
20,000	13	58	−61.2		7	57	−62.4																	
21,000	6	49	−58.3																					

Altitude (meters) m.s.l.	Stations and elevations in meters above sea level								Altitude (meters) m.s.l.	Stations and elevations in meters above sea leve						
	Atlantic station No. 1[3] (5 m.)				Atlantic station No. 2[4] (5 m.)					Atlantic station No 1[3] (5 m.)				Atlantic station No. 2[4] (5 m.)			
	Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.		Number of obs.	P.	T.	R. H.	Number of obs.	P.	T.	R. H.
Surface	30	1,016	21.0	83	30	1,019	18.0	85	9,000	28	325	−31.4	46	28	322	−35.0	42
500	30	959	17.4	83	30	962	14.9	84	10,000	28	282	−39.4	44	27	279	−42.7	
1,000	30	904	14.9	78	30	906	12.6	78	11,000	28	243	−46.6		27	240	−50.1	
1,500	30	852	12.8	72	30	854	11.0	70	12,000	26	208	−53.3		27	205	−55.9	
2,000	30	803	10.5	69	30	804	9.1	62	13,000	26	178	−59.1		26	175	−59.5	
2,500	30	756	8.3	64	30	756	6.9	58	14,000	26	152	−62.2		25	149	−59.9	
3,000	30	711	5.9	59	29	712	4.4	53	15,000	23	129	−62.0		23	127	−59.1	
4,000	30	629	0.8	55	29	629	−1.1	49	16,000	20	110	−61.4		22	108	−58.8	
5,000	30	555	−4.8	49	29	554	−6.8	46	17,000	20	93	−61.2		22	92	−58.2	
6,000	30	488	−10.5	46	29	486	−13.1	44	18,000	18	79	−60.4		20	78	−57.3	
7,000	29	428	−16.9	46	29	426	−19.9	42	19,000	16	67	−58.9		15	67	−56.1	
8,000	28	374	−24.1	46	29	371	−27.6	41	20,000					6	56	−55.0	

NOTE.—All observations taken at 1 a. m., seventy-fifth meridian time, except those at Washington, D. C., Lakehurst, N. J., Norfolk, Va., and Pensacola, Fla., where they are taken before 5 a. m., seventy-fifth meridian time. At Pearl Harbor, T. H., observations are taken after sunrise.

None of the means included in this table are based on less than 15 surface or 5 standard level observations.

Number of observations refers to pressure only as temperature and humidity data are missing for some observations at certain levels; also, the humidity data are not used in daily observations when the temperature is below −40.0° C.

[1] U. S. Navy.
[2] Airplane observations.
[3] In or near the 5 square: Lat. 35° 00′ N. to 40° 00′ N. Long. 55° 00′ W. to 60° 00′ W.
[4] In or near the 5 square: Lat. 40° 00′ N to 45° 00′ N. Long. 40° 00′ W. to 45° 00′ W.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during June 1940. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (870 m.)			Brownsville, Tex. (17 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (18 m.)			Chicago, Ill. (192 m.)			Cincinnati, Ohio (157 m.)			Denver, Colo. (1,627 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	146	3.2	30	220	1.3	30	230	2.3	30	41	1.3	30	322	1.4	30	228	4.3	29	121	6.0	28	255	5.4	27	224	1.5	30	191	3.1	29	260	2.2	30	235	2.4	30	97	1.8
500							30	227	2.3										29	126	7.4	28	256	7.8	26	233	5.0	30	201	4.8	29	241	3.2	30	246	4.3			
1,000	30	139	3.7				30	242	3.2				30	315	2.4	30	315	4.8	27	137	5.4	26	261	8.8	26	254	6.5	29	217	4.5	29	253	6.2	30	255	6.2			
1,500	30	146	3.0				29	253	3.1	30	205	0.1	30	308	2.6	30	324	4.4	24	144	3.4	24	266	8.8	24	261	7.0	24	241	4.4	25	261	6.9	30	260	7.2			
2,000	27	163	3.0	30	186	1.5	25	257	3.7	30	307	1.1	27	295	3.7	30	317	3.3	12	128	1.9	20	268	9.0	22	276	8.2	22	262	5.1	23	274	7.3	26	269	7.3	30	71	1.6
2,500	25	257	1.4	30	220	0.5	25	261	4.4	27	267	3.4	25	295	6.5	30	287	3.3	12	198	0.7	18	272	9.3	17	296	8.8	21	259	5.4	20	279	9.1	20	282	8.2	30	57	1.7
3,000	24	268	2.7	30	289	1.1	25	262	6.1	27	267	6.8	21	294	10.0	29	254	5.1				17	271	10.4	11	295	10.0	18	256	6.0	18	290	8.8	19	289	10.1	30	25	1.0
4,000	21	289	2.7	29	306	2.1	23	262	6.9	24	269	11.6	17	292	14.4	27	262	6.5				13	290	14.3				15	252	3.0	15	291	11.4	15	285	9.8	29	308	4.3
5,000	20	278	2.7	26	332	3.9	20	265	8.7	19	278	13.8	14	291	18.2	19	269	9.3				10	283	18.1							14	300	14.8	11	283	10.7	26	294	6.7
6,000	20	275	3.0	23	318	5.0	20	276	8.9	17	284	16.3	12	288	19.5	17	273	10.1													11	292	19.3	10	287	10.9	23	309	6.2
8,000	17	242	5.5	21	300	7.4	12	263	6.7	15	278	19.3				11	270	13.9																			18	295	7.7
10,000	14	234	7.5	16	304	8.8																															14	325	9.3
12,000	12	254	9.4	14	278	10.3																															13	291	10.2
14,000	11	254	10.5	11	281	10.5																															11	290	13.4

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.)			Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (766 m.)			Jacksonville, Fla. (14 m.)			Las Vegas, Nev. (570 m.)			Little Rock, Ark. (79 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (10 m.)			Minneapolis, Minn. (261 m.)			Mobile, Ala. (10 m.)			Nashville, Tenn. (194 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	216	1.1	30	199	1.2	29	318	1.9	30	236	2.1	28	315	1.2	27	130	2.2	30	159	2.3	30	173	1.3	30	295	2.0	29	107	3.7	29	265	2.1	30	175	3.3	29	247	1.9
500										30	240	3.6				27	160	3.6				30	179	2.2	30	304	2.4	28	121	5.2	29	282	3.1	30	191	4.2	29	236	3.2
1,000										30	241	5.2	28	298	1.1	25	192	2.6				29	184	2.4	30	316	2.7	25	131	4.3	28	280	4.0	26	213	3.7	29	240	3.9
1,500	30	207	1.2				29	317	2.1	30	253	5.7	28	261	2.5	22	227	3.0	30	190	3.8	27	195	3.1	30	308	1.5	25	130	3.2	27	276	5.9	26	222	3.1	28	234	4.6
2,000	30	236	0.8	30	209	1.5	29	311	3.1	29	265	6.3	28	258	4.7	22	244	3.7	30	200	3.7	27	204	3.0	30	260	1.1	25	128	2.9	25	290	8.2	24	227	2.5	28	248	5.1
2,500	30	280	0.8	30	234	1.8	29	292	2.9	25	278	7.8	26	252	5.6	22	249	4.0	30	218	4.1	24	211	3.4	30	220	1.5	24	126	3.0	20	295	9.3	20	226	3.6	24	256	4.8
3,000	29	324	0.9	30	221	2.4	29	274	2.5	25	284	9.3	24	262	8.0	22	250	4.1	30	238	3.6	18	233	3.6	30	246	2.0	24	152	2.9	15	304	11.8	20	225	4.0	19	265	5.7
4,000	27	284	1.9	29	231	4.3	28	285	2.2	21	288	11.4	21	272	12.1	20	245	3.4	30	234	5.0	14	273	4.5	28	273	4.4	23	175	3.1	12	302	12.0	16	215	5.0	15	267	5.8
5,000	20	284	1.9	28	246	5.4	25	290	4.4	18	289	12.9	13	278	14.5	17	232	3.8	30	239	4.1	10	305	5.6	28	272	5.7	19	204	3.4				11	235	3.6	11	289	7.6
6,000	12	263	2.1	25	251	6.0	22	279	4.7	15	286	16.1				15	278	4.4	28	241	3.2				26	262	7.9	18	213	2.2									
8,000				15	309	4.9										13	271	7.1	28	270	4.7				20	264	10.3	15	341	1.0									
10,000				14	285	4.6										13	259	9.5	27	289	5.1				19	271	12.7												
12,000				12	323	3.6										11	297	10.5	26	269	7.6				17	266	14.6												
14,000				11	314	2.8													23	264	7.0				15	261	17.0												
16,000																			17	247	5.2				14	263	11.9												
18,000																			10	101	1.1																		

Altitude (meters) m. s. l.	New York, N. Y. (15 m.)			Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (344 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			San Antonio, Tex. (183 m.)			San Diego, Calif. (15 m.)			Sault St. Marie, Mich. (230 m.)			Seattle, Wash. (14 m.)			Spokane, Wash. (603 m.)			Washington, D. C. (10 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	28	228	4.3	30	285	4.9	30	154	3.6	30	200	0.2	30	257	2.3	30	18	2.3	30	244	2.0	30	140	1.9	28	208	4.0	30	287	2.3	30	315	2.7	28	234	3.7	30	249	2.6
500	28	258	5.3	30	284	3.4	30	156	4.5	30	160	0.1	30	258	2.9				30	231	4.0	30	142	3.1	28	238	2.5	30	290	3.0	30	345	2.1				30	241	4.5
1,000	28	268	8.6	30	247	1.6	30	155	3.7	29	225	1.2	30	263	3.1	30	17	2.3	30	229	4.9	30	157	3.1	22	274	0.9	30	268	3.8	27	319	1.4	25	342	4.1	28	250	5.7
1,500	28	279	9.6	29	243	1.7	30	187	3.2	26	234	2.8	30	259	3.4	30	346	2.1	30	250	5.5	29	159	5.0	22	251	2.0	28	276	6.7	25	272	1.2	28	243	4.5	26	271	7.2
2,000	22	287	10.8	29	224	1.5	29	203	2.5	26	252	4.7	30	247	3.1	29	327	1.3	27	257	6.0	26	174	2.1	20	234	2.1	25	277	8.5	24	244	2.6	28	246	4.2	26	283	8.9
2,500	19	289	10.0	29	223	1.3	29	200	1.9	26	276	5.9	30	248	2.9	27	284	3.4	24	264	6.5	24	207	2.4	19	212	3.0	22	288	10.3	24	244	3.7	25	230	5.2	24	284	9.8
3,000	16	289	10.4	29	233	1.0	24	223	2.0	24	294	6.4	30	252	2.0	27	279	8.5	23	272	7.0	23	242	3.0	18	300	4.9	21	288	10.4	23	247	5.8	24	254	7.0	24	285	10.9
4,000				28	258	1.8	20	283	1.8	20	302	9.7	30	299	1.4	22	288	10.0	18	288	7.1	22	255	3.3	16	202	4.9	18	299	13.4	22	253	9.6	22	260	11.0	21	285	12.5
5,000				26	251	1.2	16	323	4.0	18	300	12.0	27	332	1.6	19	292	13.2	18	300	7.1	18	248	2.6	15	204	4.0	17	297	15.3	19	255	13.2	17	267	14.0	15	279	11.5
6,000				26	242	2.3	13	307	5.7	17	306	13.0	24	307	2.5	17	288	14.4	15	288	8.5	16	248	3.9	13	252	1.5	15	298	19.9	14	256	16.4	16	266	17.1	14	275	14.6
8,000				19	251	2.8				12	302	9.4	20	296	2.3	13	287	19.2				11	272	4.0				11	300	24.4				11	262	21.4			
10,000				17	236	3.6							18	291	3.8	10	295	17.2				10	252	6.2				11	302	30.5									
12,000				16	252	3.0							16	293	6.2																								
14,000				12	304	4.1							13	281	9.9																								

TABLE 3.—*Maximum free-air wind velocities (m. p. s.,) for different sections of the United States based on pilot-balloon observations during June, 1940*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Max. Vel	Direction	Altitude (m) m. s. l.	Date	Station	Max. Vel.	Direction	Altitude (m) m. s. l.	Date	Station	Max. Vel.	Direction	Altitude (m) m. s. l.	Date	Station
Northeast [1]	34.3	WSW	1,780	28	Toledo, Ohio	42.4	WNW	4,490	20	Columbus, Ohio	39.0	NW	7,010	20	Columbus, Ohio.
East-Central [2]	46.0	WSW	1,510	28	Louisville, Ky	36.5	WNW	3,660	20	Cincinnati, Ohio	53.0	SW	13,500	2	Greensboro, N. C.
Southeast [3]	29.0	WSW	730	25	Tampa, Fla	36.0	WNW	4,480	29	Spartanburg, S. C	41.0	SW	11,020	1	Jacksonville, Fla.
North-Central [4]	40.3	SW	1,520	14	Duluth, Minn	41.4	WNW	4,678	19	Madison, Wis	63.0	W	10,650	15	S. Ste. Marie, Mich.
Central [5]	32.3	WSW	1,110	30	Omaha, Nebr	42.0	W	3,160	30	Moline, Ill	58.0	NW	8,110	20	Chicago, Ill.
South-Central [6]	29.7	SW	618	27	Oklahoma City, Okla	28.5	N	2,630	12	Amarillo, Tex	44.8	WNW	6,410	2	Amarillo, Tex.
Northwest [7]	31.8	NW	750	19	Ellensburg, Wash	51.4	SW	4,760	12	Ellensburg, Wash	54.0	W	9,133	26	Tatoosh Island, Wash.
West-Central [8]	34.7	WSW	2,420	8	Casper, Wyo	34.2	SSW	3,800	1	Ely, Nev	45.6	SSE	6,840	18	Oakland, Calif.
Southwest [9]	21.6	ESE	2,242	24	Albuquerque, N. Mex.	34.5	SSE	5,000	18	Fresno, Calif	41.3	NW	5,940	4	Fresno, Calif.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except extreme west Texas), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during June 1940, classified according to the potential temperatures (10° intervals between 290° and 409° A.) with which they are identified (based on radiosonde observations)*

Potential temperatures, °A.	Albuquerque, N. Mex.			Atlanta, Ga.			Billings, Mont.			Bismarck, N. Dak.			Boise, Idaho			Buffalo, N. Y.			Charleston, S. C.		
	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290–299																					
300–309																					
310–319													1	7.4	−34.0	6	8.6	−44.8			
320–329				3	8.5	−33.0	13	10.4	−52.5	6	9.6	−44.2	12	8.7	−41.5	8	9.5	−47.8	1	9.8	−47.0
330–339	12	11.7	−56.3	15	10.9	−49.3	20	11.6	−56.3	23	11.2	−53.1	20	10.8	−50.0	15	10.6	−48.6	12	11.1	−49.8
340–349	25	12.3	−56.2	18	12.5	−57.7	14	12.5	−59.9	18	12.4	−59.6	22	12.4	−55.4	20	12.4	−58.4	19	12.5	−57.2
350–359	9	13.3	−59.7	12	14.0	−65.9	6	13.5	−63.3	4	13.2	−57.2	6	13.0	−57.5	12	13.7	−64.4	18	13.7	−63.6
360–369	5	14.2	−63.4	10	14.7	−68.1	3	14.1	−63.0	4	13.9	−62.2	4	14.2	−61.5	2	13.7	−59.0	10	15.0	−70.1
370–379	6	15.1	−65.7	7	16.0	−72.4	3	14.6	−62.0	1	14.6	−60.0	3	14.6	−60.7	4	14.2	−59.2	6	15.3	−68.0
380–389	7	16.5	−66.4	1	17.3	−76.0	1	15.6	−67.0	3	14.9	−60.7	5	15.1	−61.4	3	14.7	−59.0	6	15.8	−65.7
390–399	3	16.2	−67.0	3	16.5	−68.3	2	16.0	−65.0	4	15.7	−60.5	5	15.9	−63.6	4	15.2	−57.8	2	16.0	−65.5
400–409	5	17.0	−68.2	4	16.7	−67.5	4	16.7	−65.5	5	16.0	−59.6	2	16.5	−61.0	3	15.9	−61.0	2	17.8	−71.5
Weighted means		13.6	−60.2		13.4	−60.4		12.5	−58.5		12.5	−56.2		12.1	−53.4		12.2	−55.4		13.6	−61.2
Mean potential temperature °A. (weighted)	357.7			355.0			346.5			350.5			347.7			348.0			356.6		
Number of days with observations	28			24			27			21			25			25			20		

Potential temperatures, °A.	Denver, Colo.			El Paso, Tex.			Ely, Nev.			Fairbanks, Alaska			Joliet, Ill.			Juneau, Alaska			Lakehurst, N. J.		
	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.
290–299																1	5.7	−33.0			
300–309										2	8.6	−55.0				6	7.3	−40.7			
310–319							1	9.0	−39.0	23	9.1	−49.8				20	9.0	−49.6	1	8.4	−44.0
320–329	3	10.2	−50.0				10	10.1	−48.0	28	10.3	−55.4				22	10.2	−53.7	6	9.2	−41.0
330–339	21	10.9	−49.3	11	12.0	−57.7	28	10.9	−49.4	6	11.3	−57.8	11	10.7	−49.3	1	11.9	−60.0	7	10.7	−48.9
340–349	28	12.1	−53.6	18	12.0	−53.5	22	12.2	−55.8				20	12.6	−59.4	1	10.6	−48.0	15	12.4	−58.3
350–359	15	13.2	−59.5	13	13.4	−61.3	9	13.2	−57.9	1	11.2	−48.0	7	13.8	−64.3				7	13.8	−65.1
360–369	8	14.0	−61.9	7	14.6	−66.1	6	14.0	−62.2				6	12.0	−54.5				3	14.4	−66.3
370–379	6	14.8	−61.8	10	15.4	−67.4	6	14.8	−63.2	1	12.6	−47.0	2	15.1	−64.5				1	15.0	−64.0
380–389	3	15.8	−66.0	6	16.1	−69.5	5	15.7	−64.4				2	15.4	−64.5	1	13.8	−50.0			
390–399	4	16.2	−64.2	5	16.6	−69.6	6	16.1	−64.7				4	15.8	−62.0						
400–409	4	16.7	−64.5	8	16.9	−67.6	3	16.7	−65.3	2	14.5	−47.5	3	16.3	−62.3				2	16.2	−61.0
Weighted means		12.8	−56.1		14.0	−62.0		12.5	−55.3		10.1	−53.0		12.9	−58.2		9.4	−50.2		12.2	−55.9
Mean potential temperature °A. (weighted)	352.6			362.8			350.5			324.7			348.5			319.7			346.2		
Number days with observations	27			28			29			28			21			22			24		

TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during June 1940, classified according to the potential temperatures (10° intervals between 290° and 409° A.) with which they are identified (based on radiosonde observations)*—Continued

Potential temperatures, °A.	Medford, Oreg.			Miami, Fla.			Nashville, Tenn.			Oakland, Calif.			Oklahoma City, Okla.			Omaha, Nebr.			Phoenix, Ariz.		
	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290–299																					
300–309																					
310–319	1	9.5	−46.0																		
320–329	9	9.9	−48.9				2	9.8	−44.5	6	9.8	−45.2	6	10.3	−51.2	3	9.2	−40.0	2	10.2	−48.0
330–339	23	11.1	−52.8	2	10.4	−44.5	13	10.8	−48.8	24	10.9	−49.4	6	10.8	−47.8	12	10.4	−43.5	15	10.7	−46.8
340–349	24	12.2	−56.4	16	12.7	−59.4	12	12.8	−60.4	18	12.2	−56.2	25	12.6	−58.8	22	12.4	−57.6	25	12.0	−52.6
350–359	11	12.9	−57.5	19	14.2	−67.1	17	13.6	−62.1	13	13.3	−61.0	10	13.6	−63.3	14	13.7	−64.2	14	13.4	−60.1
360–369	6	14.1	−60.3	12	15.1	−70.5	4	14.6	−66.8	7	13.8	−61.1	4	14.9	−68.2	4	13.8	−59.0	3	14.3	−62.7
370–379	4	14.9	−63.0	3	15.3	−67.3	8	17.2	−67.8	7	14.8	−65.4	3	15.5	−70.3	1	14.2	−60.0	7	15.2	−66.1
380–389	6	15.4	−63.2	5	16.5	−72.6	3	15.5	−66.0	8	15.5	−65.2	2	16.0	−69.5	4	15.1	−61.0	6	15.9	−68.2
390–399	1	16.6	−69.0	5	17.0	−73.0	4	15.7	−62.2	5	16.3	−65.8	3	16.4	−68.3	2	16.0	−62.0	4	16.3	−65.2
400–409	5	16.7	−65.0	2	17.3	−72.0	2	16.9	−68.0	5	16.6	−65.0	1	17.3	−69.0	3	15.0	−64.7	8	17.2	−69.5
Weighted means		12.5	−56.4		14.4	−66.2		13.6	−59.9		12.9	−57.2		13.0	−59.9		12.7	−56.4		13.3	−57.5
Mean potential temperature °A. (weighted)		349.5			361.0			350.4			354.7			350.4			352.5			358.0	
Number days with observations		28			24			29			28			26			25			27	

Potential temperatures, °A.	Portland, Maine			St. Louis, Mo.			San Antonio, Tex.			San Diego, Calif.			Sault Ste. Marie, Mich.			Spokane, Wash.			Atlantic Station			Atlantic Station		
	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	No. 1[1] Mean altitude (km.) m.s.l.	Mean temperature °C.	Number of cases	No. 2[2] Mean altitude (km.) m.s.l.	Mean temperature °C.
290–299													1	6.7	−41.0									
300–309	2	7.0	−35.5																					
310–319	8	7.9	−38.2										5	8.1	−42.2	1	8.4	−40.0				1	7.6	−33.0
320–329	9	9.4	−44.4	4	9.4	−45.0	1	12.6	−69.0	2	9.8	−44.0	6	9.6	−46.2	14	9.8	−48.5	2	9.6	−42.5	7	9.4	−41.7
330–339	20	10.9	−50.6	11	11.2	−50.9	9	11.2	−51.7	10	10.9	−49.5	18	11.0	−53.5	21	11.2	−54.1	15	10.5	−45.9	24	11.2	−52.9
340–349	22	12.5	−59.3	20	12.3	−56.0	25	12.0	−53.2	7	12.5	−58.6	16	12.5	−60.9	12	12.0	−56.2	21	12.7	−57.5	16	12.4	−58.9
350–359	10	13.2	−61.2	15	13.5	−62.6	16	13.2	−57.9	6	13.3	−60.8	6	13.0	−60.5	7	13.0	−57.7	17	13.6	−62.7	10	13.1	−60.5
360–369	5	13.3	−56.6	8	14.4	−64.6	13	14.6	−65.8	3	14.1	−61.7	1	13.6	−59.0	2	13.8	−58.5	5	14.3	−64.4	6	14.0	−61.0
370–379	4	14.7	−63.2	2	15.0	−64.0	6	15.2	−65.7	2	14.8	−64.5	2	14.0	−60.0	2	14.8	−64.0	1	15.1	−66.0	2	15.1	−66.5
380–389	6	14.3	−54.7	8	15.8	−65.1	4	16.0	−67.8	4	15.7	−67.0	4	14.0	−54.0	4	14.4	−55.2	4	15.2	−61.5	1	14.7	−58.0
390–399	3	15.2	−57.7	1	15.7	−63.0	5	16.3	−67.2	3	16.6	−69.7	3	15.1	−59.0	3	15.3	−60.0	1	16.4	−66.0	1	16.0	−62.0
400–409	2	15.8	−59.5	6	16.5	−63.0	4	16.9	−66.2	1	17.2	−69.0	1	15.9	−61.0	4	16.0	−59.5	1	16.2	−62.0	2	16.4	−61.5
Weighted means		11.8	−53.4		13.3	−58.7		13.5	−59.2		13.1	−58.4		11.8	−55.0		12.0	−54.5		12.7	−56.9		12.1	−55.4
Mean potential temperature °A. (weighted)		346.2			356.7			358.3			354.9			344.1			348.1			350.2			345.4	
Number days with observations		29			27			25			17			26			26			25			27	

[1] In or near the 5 square: Lat. 35°00′ N. to 40°00′ N. Long. 55°00′ to 60°00′ W.
[2] In or near the 5 square: Lat. 40°00′ N. to 45°00′ N. Long. 40°00′ W. to 45°00′ W.

WEATHER ON THE NORTH ATLANTIC OCEAN

By H. C. HUNTER

Atmospheric pressure.—The pressure averaged somewhat above normal over the southeastern portion but near normal over the southwestern. A considerable deficiency appears near the coasts of New England and Nova Scotia, where the last week of the month was marked by quite low pressure for the season.

The extremes of pressure in available vessel reports were 1034.9 and 992.6 millibars (30.56 and 29.31 inches). The high mark was noted near 45° N., 45° W., during the afternoon of the 21st, on the American steamship *Gateway City*. In the very same part of the ocean (44° N., 43° W.) the low reading was made very clearly on the 6th, by the American liner *President Roosevelt*. Table 1 shows that a lower pressure was noted on the 14th at Belle Isle, Newfoundland.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, June 1940*

Station	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Millibars	*Millibars*	*Millibars*		*Millibars*	
Lisbon	1,017.6	+0.7	1,025	26	1,009	23
Horta	1,025.0	+1.0	1,032	12, 17	1,015	6, 27
Belle Isle, Newfoundland [1]	1,010.6	−0.6	1,023	8, 10, 22	982	14
Halifax, Nova Scotia	1,012.1	−2.8	1,026	10	1,001	29
Nantucket	1,012.9	−2.3	1,027	17	998	26
Hatteras	1,015.6	−0.7	1,024	22	1,002	25
Turks Island	1,016.8	−0.1	1,020	13	1,012	20
Key West	1,015.9	+0.3	1,021	27	1,013	25
New Orleans	1,015.2	0.0	1,021	30	1,010	16

[1] For 23 days.

NOTE.—All data based on available observations, departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—There was little of note in the matter of high winds. The middle portion of the month, from 10th to 21st, was particularly quiet.

On the 3d a well-marked LOW was central nearly over Labrador, advancing eastward. A trough was developing to southward of the center, and by the evening of the 4th was of considerable strength, with well-marked center near 45° N., 45° W. There was little change in location of this center until the 6th, when it began to move with moderate speed toward the east-northeast, but with decreasing energy. Several vessels met fresh to strong gales in connection with this LOW system.

On the evening of the 21st a cyclone of moderate strength was centered over Labrador with a trough developing to the southward. Within this trough a well-marked center formed by the morning of the 22d when it was located about 39° N., 59° W. From this position it traveled toward the northwest till it was over New Brunswick on the evening of the 23d, but thereafter it advanced eastward, passing near Cape Race on the 25th and being near mid-ocean at about latitude 50° N., on the 27th. As with the LOW system during the early portion of the month, there were several reports of vessels meeting fresh to strong gales.

Fog.—To the southward of the 35th parallel of latitude, where fog rarely forms at this season, there was no fog reported, save a very little during the early days of the month, at a short distance off the Carolina coast. Over the waters from Hatteras to Nova Scotia there was usually somewhat more fog than the average June amount for past years, but comparatively little was recorded after the 20th. The 5° square, 40° to 45° N., 65° to 70° W., had fog on 15 days, a number not equaled by any other North Atlantic region, so far as reports indicate.

To the southeastward and eastward of Nova Scotia, as far as the eastern limits of the Grand Banks, the reports available establish but few occurrences of fog, very many less than the June averages of earlier years; this relative scarcity of fog reports seems, however, to be in considerable measure due to the diminished number of vessels now reporting for this area.

Between the southeastern edge of the Grand Banks and the eastern Azores there was a little fog, mainly between the 8th and 11th or else during the final days of June. To northward of the 45th parallel and to eastward of the 40th meridian scarcely any fog is known to have occurred; however, there have been but few vessels sending reports for this part of the ocean.

OCEAN GALES AND STORMS, JUNE 1940

Vessel	Voyage		Position at time of lowest barometer		Gale began June	Time of lowest barometer June	Gale ended June	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′				*Millibars*					
Pan Royal, Am. S. S.	Gibraltar	Dingwall, N. S.	[1]40 45 N.	45 10 W.	4	6p, 4	4	998.6	SSW	W, 5	W	SE, 9	SE-W-NNW.
Capulin, Am. S. S.	Bilbao	New York	42 24 N.	40 42 W.	5	10a, 5	6	1,002.4		W, 8		W, 8	SW-W.
President Roosevelt, Am. S. S.	Galway	do	44 12 N.	42 42 W.	6	3a, 6	6	992.6	W	WSW, 6	W	W, 8	WSW-W.
Pontchartrain, U. S. C. G.	On Station #1	Out from New York.	38 36 N.	58 48 W.	9	5p, 7	9	[2]1,005.1	NNW	W, 4	NNW	NNW, 8	WNW-S.
Bibb, U. S. C. G.	do	Out from Norfolk.	38 36 N.	58 48 W.	21	7a, 22	22	1,009.8	SSE	NNW, 8	NNW	S, 9	S-NNW.
Mosfruit, Nor. M. S.	Liverpool	New York	55 21 N.	06 10 W.	22	12m, 22	22	999.5		NNW, 5		N, 8	
Duane, U. S. C. G.	On Station #2	Out from Boston.	40 18 N.	44 00 W.	25	8p, 25	25	1,004.1	S	S, 8	WSW	S, 8	S-W.
Mosfruit, Nor. M. S.	Liverpool	New York	46 05 N.	36 31 W.	26	6p, 26	27	998.2		SW, 8	W	W, 8	SW-WSW.
Examiner, Am. S. S.	Lisbon	do	42 36 N.	28 48 W.	27	11p, 27	27	1,010.8	WSW	W, 6	W	WSW, 8	
Bibb, U. S. C. G.	On Station #1	Out from Norfolk.	39 06 N.	59 06 W.	29	2p, 30	[3]2	1,017.3	SW	SW, 9	SW	SSW, 10	SSW-WSW.
Steel Scientist, Am. S. S.	Cristobal	Boston	12 22 N.	78 15 W.	30	6p, 30	[3]2	1,008.5	NE	NE, 7	E	ENE, 8	NE-ENE.
NORTH PACIFIC OCEAN													
Yamahagi Maru, Jap. S. S.	Yokohama	Seattle	40 56 N.	150 32 E.	4	12m, 3	5	999.0	NW	NW, 3		NW, 8	
W. S. Miller, Am. S. S.	San Francisco	do	39 00 N.	124 06 W.	4	6p, 4	6	1,012.2	NW	NW, 8	N	NW, 9	None.
Manulani, Am. S. S.	do	Honolulu	37 00 N.	125 12 W.	5	9a, 5	5	1,018.0		NNW, 9	NNW	NNW, 10	
Daiiti Ogura Maru, Jap. M. S.	Yokohama	Port San Luis	42 06 N.	147 42 W.	11	2a, 11	11	982.7		W, 2		WNW, 8	E-W.
Texas, Am. S. S.	Hakodate	Coos Bay, Oreg.	45 30 N.	133 18 W.	10	3p, 11	11	1,004.4	SE	SE, 7	SE	SE, 8	
Hoegh Silverstar, Nor. M. S.	Cebu, P. I.	Los Angeles	16 22 N.	133 00 E.	14	2p, 14	14	1,003.0	S	S, 7	S	S, 7	
Winona, Am. S. S.	Los Angeles	Balboa	17 24 N.	101 54 W.	18	4a, 18	18	985.1	NNE	Calm	WSW	SW, 12	NNE-calm-SW.
La Placentia, Am. S. S.	Port San Luis	do	17 36 N.	102 18 W.	18	4a, 18	18	979.0	WNW	Calm	WSW	N, 12	N-calm-SSE.
Collingsworth, Am. S. S.	Yokohama	Seattle	48 24 N.	176 00 E.	17	8p, 18	19	976.0	S	E, 4	S	ESE, 8	E-S.
Maliko, Am. S. S.	Honolulu	San Francisco	[1]37 40 N.	122 59 W.	20	12m, 21	21	1,012.9	N	NW, 6	NW	N, 8	None.
Huguenot, Am. S. S.	Los Angeles	Seattle	39 30 N.	124 18 W.	26	4a, 26	27	1,013.5	NW	NW, 7	N	NW, 9	
Norfolk Maru, Jap. S. S.	Kobe	Victoria, B. C.	48 30 N.	178 36 W.	27	12p, 26	28	[2]1,013.9		SE, 8	E	SE, 8	
Chateau Thierry, U. S. A. T.	Honolulu	San Francisco	[1]36 57 N.	124 53 W.	26	2a, 28	28	1,012.9	N	NW, 5	NW	NNW, 8	NNW-NW.

[1] Position approximate. [2] Barometer uncorrected. [3] July.

WEATHER ON THE NORTH PACIFIC OCEAN

By WILLIS E. HURD

Atmospheric pressure.—Little change occurred in the general pressure situation over the North Pacific Ocean in June as compared with that of May. The Aleutian LOW continued in northern waters, with average barometer of 1,008.8 millibars (29.77 inches) at Dutch Harbor. This reading is −3.7 millibars (−0.11 inch) below the normal of the month.

A wide band of high average pressure extended along the coast from southeastern Alaska to Oregon and southwestward two-thirds across the ocean. At both Midway Island and Tatoosh Island, within this belt, the average pressures were 2.7 and 3.7 millibars (0.08 and 0.11 inch), respectively, above their June normals.

Low pressure from Asia overspread Far Eastern waters, but with averages above normal at Manila and Naha, and below normal at Guam.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean June 1940, at selected stations*

Stations	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Millibars	*Millibars*	*Millibars*		*Millibars*	
Point Barrow	1,019.0	+3.4	1,027	6,7	1,011	22
Dutch Harbor	1,008.8	−3.7	1,029	27	990	21
St. Paul	1,012.4	+1.2	1,031	29	1,001	20
Kodiak	1,011.2	−1.7	1,024	28	997	13
Juneau	1,016.6	+0.3	1,026	27	1,000	12
Tatoosh Island	1,020.3	+3.7	1,027	13	1,006	11
San Francisco	1,013.2	−1.4	1,019	1	1,008	15
Mazatlan	1,010.6	+0.4	1,014	21	1,007	15
Honolulu	1,015.9	−1.4	1,019	12	1,013	10
Midway Island	1,020.3	+2.7	1,025	22	1,012	6
Guam	1,007.3	−4.2	1,021	25	1,002	15
Manila	1,010.8	+3.3	1,012	8	1,007	[1] 14
Hong Kong	1,005.4	−0.4	1,011	8	997	30
Naha	1,010.0	+2.5	1,020	18	1,004	1
Titijima	1,013.1	+0.2	1,022	30	1,009	11
Petropavlosk	1,012.0	+0.8	1,024	23	1,003	16, 28

[1] And on other dates.

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observations.

Extratropical cyclones and gales.—Several cyclonic disturbances crossed northern waters in June, but so far as reported the resulting gales were few and not of force exceeding 8. These gales occurred on the 4th–5th near 41° N., 150° E.; on the 11th in scattered locations between 40° to 46° N., 133° to 150° W.; and on the 18th and 26th within the region 45° to 50° N., 175° W. to 175° E. The lowest barometer, 976 millibars (28.82 inches), was read on the American Steamship *Collingsworth* on the 18th, near 48° N., 176° E.

The stormiest part of the ocean was that lying along the California coast between 35° and 40° N. On several days this part of the coast was closely pressed by strong Pacific anticyclones which caused north to northwest gales, reaching force 10 on the 5th; force 9 on the 4th and 26th; and force 8 on the 20th and 27th.

Tropical cyclones.—Typhoon of June 10–18.—On page — of this REVIEW is an account by the Reverend Bernard F. Doucette, Weather Bureau, Manila, P. I., of a typhoon which originated east of Yap on the 10th, recurved at some distance east of Taiwan (Formosa) on the 16th, and disappeared east of northern Japan on the 18th. In this disturbance the Norwegian motor ship *Hoegh Silverstar* had a south wind of force 7, barometer 1,003 millibars (29.62 inches), near 16° N., 133° E., on the 14th.

Mexican west coast hurricane of June 18.—A small but fully developed hurricane with a calm center formed close to the Mexican coast west-northwest of Acapulco during the night of the 17th–18th. Before midnight there were thunderstorms in the vicinity of 17°–18° N., 102° W. About 2 a. m. of the 18th the southbound American Steamer *Winona* was in a strong northeasterly gale accompanied by blinding rain. At 3 a. m. the wind had increased to hurricane intensity, and at 3:30 a. m. the ship had entered the calm center of the storm in 17°24′ N., 101°54′ W., lowest barometer 985.1 millibars (29.09 inches). By 4 a. m. the wind had become southwest, again of hurricane force, thereafter lessening to force 6 at 6 a. m.

The American Steamer *La Placentia*, not far to the northwestward of the *Winona*, entered the storm area about 3:30 a. m., and a half hour later had a full hurricane wind from the north. At 4:15 a. m. she entered the calm center in 17°36′ N., 102°18′ W., with lowest barometer at 979.0 millibars (28.91 inches). Fifteen minutes later the barometer on ship had risen to 1,004.7 millibars (29.67 inches), with a south-southeast wind of force 10. By 6 a. m. the wind had fallen to force 5. Nothing further is known of the history of the storm, which was of very narrow extent, apparently moving in a west-northwest or northwest direction.

Fog.—So far as reports indicate, the usual June increase in fog over northwestern waters did not materialize, and there was little change from its frequency in May. In some 5° localities between the western Aleutians and central Japan fog was observed on 5 or 6 days. As an evidence of the continuity of fog that might be expected at this time of year, the American Steamship *Collingsworth* reported unbroken fogginess from 3:20 a. m. of June 14, in 40°10′ N., 149°50′ E., until 11:30 a. m. of the 17th in 46°49′ N., 168°22′ E. During this period no sights for position could be obtained. Between Midway Island and southern Japan there were 8 days with fog altogether, mostly occurring in the first decade of the month. Along the United States-Hawaiian routes, scatterings of fog formed on a few days. In American coastal waters fog was reported off Washington on 1 day; off Oregon on 4 days; off California on 10 days; and off Lower California on 4 days.

TYPHOONS AND DEPRESSIONS OVER THE FAR EAST

BERNARD F. DOUCETTE, S. J.

[Weather Bureau, Manila, P. I.]

Typhoon, June 10–18, 1940.—As a low-pressure area, this storm first appeared about 300 miles east of Yap on June 10. It moved in a northwesterly direction, very likely increasing to depression strength but, as far as can be ascertained, not violent over a large area. When the center reached the regions about 400 miles east of southern Formosa, it recurved to the north-northeast and northeast, intensifying sufficiently to cause pressure to fall to 749.0 mm. (998.6 mb.) at Oshima and Borodino, Nansei (Loochoo) Islands, June 17. No strong winds were reported as the center moved rapidly northeastward, requiring only 2 days to reach the ocean regions east of northern Japan after recurvature east of Formosa. On June 18 the observations which were available indicated that the storm had either died out or had continued moving northeastward toward the Aleutian Islands as an extratropical depression. Most probably no lives were lost and no destruction to property occurred, as the storm center passed close to Japan, since there were no news dispatches giving such information.

Preliminary to the appearance of the low pressure area east of Yap, there was a quiet advance of air from the southwest quadrant, appearing first at Zamboanga (June 8) and then at Yap, indicated there by the movement of the lower clouds. On June 10 there was circulation in evidence, but no intensification manifested itself as the center began to move northwesterly. As the depression moved over the ocean east of Luzon, there was power enough to bring northeasterly winds over Manila, while Cebu and Zamboanga upper winds were from the southwest quadrant. The east quadrant current in the rear of the depression moved over the Archipelago as the depression recurved. At no time were the velocities stronger than 40 k. p. h. over the Philippines. This period gives the sequence accompanying a quiet advance of the southwesterly current followed by its recession and replacement by a current from the east quadrant.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

Floods during June were largely local and confined mainly to smaller streams, due to the local, showery type of precipitation that occurred. Nebraska was the most affected, with two such floods; the first occurred in the northeastern part of the state early in June, followed by another, a few days later, in the western portion.

Atlantic slope drainage.—A slight rise occurred in the James and Roanoke Rivers as the result of heavy rains the last 2 days of May. Slight overflows occurred in low places along the rivers but no damage of consequence was reported.

Upper Mississippi Basin.—Heavy showers in central Wisconsin during the first and third weeks of June resulted in two rises in some of the streams in that state. The Chippewa River rose to within 0.2 foot of flood stage at Durand, Wis., on June 10. In the Wisconsin River, flood stage was exceeded at Knowlton, Wis., on the 9th and 25th and at Portage, Wis., on the 29th. The stages were not extremely high and damage was only slight.

A local flood occurred in the Maquaketa River in connection with a rainfall of 5.10 inches at Delaware, Iowa, on June 24. A river stage of 18.3 feet was reached at that place.

Ohio Basin.—Severe thunderstorms, on June 10th and June 18, centered mainly over Cattaraugus County, N. Y., resulted in local flooding in the smaller streams. Property loss to roads and bridges and crop loss estimated at $200,000 resulted.

Missouri Basin.—On June 4 and 5 excessively heavy rains in northeast Nebraska caused disastrous floods in small streams in that section of the state. Heavy damage resulted in Burt, Cuming, Dixon, Dakota, Madison, Stanton, and Thurston Counties, with the greatest damage in the towns of Homer, Pender, and Winnebago. About 5 lives were lost and property damage has been estimated at $1,816,000.

The area in which the heavy rain occurred is hilly so that the run-off was rapid. The run-off was sufficiently large to cause flood conditions also in some of the larger streams such as Logan Creek and Elkhorn River.

Western Nebraska experienced a somewhat similar flood from heavy rains on June 6 and 7. Medicine Creek reached a stage within 3 feet of the 1935 high level. The high water from Frenchman Creek and other creeks flowing into the Republican River, in addition to Medicine Creek, resulted in only slight flooding in the main channel of the Republican. The stage reached at Guide Rock, Nebr., was 9.1 feet on the 10th, 0.1 foot above flood stage. The damage reported was only slight.

A heavy rainstorm was centered in Leavenworth County, Kansas, on June 20 when 9.05 inches of rain was measured at Tonganoxie between midnight and noon. The run-off and discharge accounted for a 24-hour rise of 3.8 feet to a stage of 7.3 feet, in the Kansas River at Lecompton, Kans., and for a stage of 13.2 feet, highest for the month, in the Missouri River at Kansas City on the same date.

Arkansas Basin.—On the 8th and 9th flooding occurred in Kansas in the Pawnee River and some of the nearby small streams, principally in Pawnee and Edwards Counties. The Arkansas River reached flood stage at Great Bend, Kans., from this run-off. The total damage in Pawnee and Edwards Counties has been estimated at $65,000.

The North Canadian River was slightly above flood stage from June 11 to 22. A monetary loss of $17,000 has been estimated.

Red Basin.—Slight flooding occurred in the Sulphur River in Texas from June 15 to 25 but little or no damage resulted.

West Gulf of Mexico drainage.—The upper Trinity River experienced above flood stages during the month. Most of the damage, estimated at $12,000, was centered at or near Dallas, Tex., where a stage of 34 feet was reached on June 16th.

The Rio Grande reached and exceeded flood stage at Mercedes and Brownsville, Tex., but no water left the main channel anywhere on the American side of the river where damage would result.

TABLE OF ESTIMATED FLOOD LOSSES, JUNE 1940

River and drainage	Tangible property	Matured crops	Prospective crops	Livestock and other movable farm property	Suspension of business	Total
Mississippi system, Missouri Basin, rivers in northeastern Nebraska	$743,000	$105,000	$850,000	$105,000	$13,000	$1,816,000
Floyd River	12,000					12,000
Kansas River	[1] 13,650		17,500			31,150
Allegheny River	[1] 200,000					200,000
Arkansas River	20,000		45,000			65,000
North Canadian River	10,000	4,500	2,000		500	17,000
Trinity River	12,000					12,000

[1] Cattaraugus County, N. Y.

FLOOD-STAGE REPORT FOR JUNE 1940

[All dates in June unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
James:	*Feet*			*Feet*	
Bremo Bluff, Va.	19	1	2	21.95	1
Columbia, Va.	10	May 31	4	21.8	2
State Farm, Va.	12	1	2	13.5	2
Richmond, Va.	8	2	2	8.7	1
Roanoke:					
Randolph, Va.	21	1	2	23.3	2
Weldon, N. C.	31	2	3	33.8	2
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Wisconsin:					
Knowlton, Wis.	12	8	11	16.2	9
		24	26	15.8	25
Portage, Wis.	17	27	30	18.3	29
Meramec: Sullivan, Mo.	11	29	29	11.2	29
Mississippi: Louisiana, Mo.[1]	12	18	21	12.1	21
		26	29	12.1	27-28
Missouri Basin					
Floyd: James, Iowa	14	4	5	15.4	5
Republican: Guide Rock, Nebr.	9	10	10	9.1	10
Arkansas Basin					
North Canadian:					
Woodward, Okla.	5	11	11	5.2	11
Canton, Okla.	8	11	12	9.0	12
		2	5	9.4	3
Yukon, Okla.	8	8	23	11.9	14
		28	28	8.1	28
Red Basin					
Little: Whitecliffs, Ark.	25	May 31	1	25.3	1
Sulphur:					
Ringo Crossing, Tex.	20	(2)	2		
		15	20	24.3	16
		30	(3)		
Naples, Tex.	22	(2)	7	26.2	2
		20	25	25.0	22
WEST GULF OF MEXICO DRAINAGE					
Trinity:					
Dallas, Tex.	28	11	11	28.1	11
		15	19	34.0	16
Trinidad, Tex.	28	21	27	32.3	25
Liberty, Tex.	24	12	12	25.5	12
Guadalupe: Gonzales, Tex.	20	30	(3)		
Rio Grande:					
Mercedes, Tex.	21	27	28	22.0	28
Brownsville, Tex.	18	27	28	18.2	28

[1] Above flood stages caused by operations at Dam. No. 24.
[2] Continued from preceding month.
[3] Continued into next month.

CLIMATOLOGICAL DATA

[For description of tables and charts, see REVIEW, January, pp. 32 and 38]

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Section	Temperature								Precipitation					
			Monthly extremes								Greatest monthly		Least monthly	
	Section average	Departure from the normal	Station	Highest	Date	Station	Lowest	Date	Section average	Departure from the normal	Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	77.3	−1.0	Andalusia	99	8	Scottsboro	49	1	6.43	+2.23	Fairhope	15.46	Moulton	2.48
Arizona	77.6	+2.2	Parker	120	14	Alpine	26	11	.90	+.53	Rucker Canyon	5.18	11 stations	.00
Arkansas	75.2	−1.9	Harrison	98	27	2 stations	45	1	4.35	+.28	Grannis	9.66	Wilson	1.12
California	70.8	+2.6	2 stations	122	1 14	Tamarack	26	3	.08	−.25	Orick (near)	1.02	133 stations	.00
Colorado	64.5	+2.8	Las Animas	107	26	Pearl	15	10	.70	−.60	Sterling	4.17	San Isabel	.00
Florida	79.9	+.1	Fernandine	102	20	Mason	54	1 1	6.89	+.18	Mason	17.28	Key West	1.10
Georgia	77.9	−.2	Glennville	102	19	Blairsville	45	2	4.68	+.25	Alapaha	10.59	2 stations	1.76
Idaho	64.6	+4.2	2 stations	110	19	Pelton's Ranch	19	8	.72	−.57	Irwin	2.30	3 stations	T
Illinois	73.2	+1.1	Greenville	98	1 6	Waukegan	37	21	2.92	−1.00	Rockford	9.47	Benton	.93
Indiana	72.2	+.7	2 stations	98	1 6	Frankfort	36	21	3.11	−.73	Salem	6.29	Princeton	1.00
Iowa	71.3	+1.7	Glenwood	101	18	Elkader	42	1 20	3.56	−1.05	Spencer	7.53	Eddyville	.87
Kansas	74.3	+.4	Ashland	110	26	Tribune	38	24	2.66	−1.29	Tonganoxie	13.35	Phillipsburg	.44
Kentucky	73.1	−.7	Smiths Grove	100	23	Lynch (near)	44	1 1	3.39	−.76	Farmers	7.76	Addison	.93
Louisiana	78.6	−1.5	Natchitoches	99	3	Franklinton	54	1	9.33	+4.66	Lake Arthur (near)	20.55	Port Sulphur	3.07
Maryland-Delaware	71.8	+1.0	Dundalk, Md	96	13	Oakland, Md	33	21	2.09	−1.88	Tonoloway, Md	6.50	Crisfield, Md	.29
Michigan	63.4	+.1	2 stations	95	1 3	2 stations	26	14	4.45	+1.37	Three Rivers	8.46	Mackinaw City	1.98
Minnesota	64.3	−.6	Canby	100	2	do	28	20	3.67	−.35	St. Peter	11.05	Angus	.61
Mississippi	77.1	−1.7	2 stations	98	1 20	do	50	1 2	6.09	+1.84	Collins	12.04	Water Valley	2.25
Missouri	73.5	−.1	St. Charles	98	6	Kidder	44	24	4.36	−.28	Lebanon	8.61	Jackson	1.40
Montana	62.8	+2.9	Thompson Falls	101	12	King's Hill	23	23	2.02	−.44	Vida (near)	5.16	Libby	.40
Nebraska	71.7	+2.3	Mullen	107	29	4 stations	34	1 9	2.81	−.80	Norfolk	11.24	Lyman	.42
Nevada	70.1	+5.5	Overton	120	12	2 stations	24	1 4	.41	−.08	Beowawe	1.27	2 stations	.00
New England	61.6	−2.4	Waterbury, Conn	93	1 4	do	29	22	3.62	+.16	Squa Pan Dam, Maine.	7.78	New Bedford, Mass.	1.46
New Jersey	68.6	−.4	Elizabeth	95	1 4	3 stations	32	1 21	3.28	−.55	Long Valley	6.00	Atlantic City	1.55
New Mexico	68.6	−.3	Rodeo	105	18	Eagle Nest	15	8	1.10	−.16	Roswell	4.20	3 stations	.00
New York	64.2	−.8	3 stations	93	4	3 stations	30	22	4.21	+.55	Indian Lake	7.18	Cairo	1.54
North Carolina	75.3	+1.3	Moncure	103	27	Banners Elk	34	21	3.56	−1.11	Andrews	11.01	Nashville	.96
North Dakota	63.1	+.1	Lisbon	102	16	Hannah	27	19	2.24	−1.15	Mary	4.96	Pettibone	.52
Ohio	70.6	+1.0	2 stations	97	7	Millport	36	21	4.79	+.92	Mansfield	8.79	Dayton No. 1	1.94
Oklahoma	75.7	−1.6	3 stations	108	1 26	Kenton	43	11	3.49	−.34	Tulsa (City Office)	10.08	Kenton	.29
Oregon	63.8	+4.1	2 stations	110	19	Chemult	18	8	.30	−.93	Zigzag R. S	1.46	4 stations	.00
Pennsylvania	67.8	−.3	4 stations	95	1 3	Kane	31	20	4.11	−.02	Connellsville	9.28	Reading	1.40
South Carolina	78.3	+.9	Conway	102	19	Longcreek (near)	45	2	3.45	−1.28	Caesars Head	9.37	Myrtle Beach	1.46
South Dakota	68.0	+1.6	3 stations	105	1 16	McIntosh	33	11	3.01	−.36	Canton	9.58	Hot Springs	.90
Tennessee	74.3	−.4	Union City	99	6	Gatlinburg	42	2	4.04	−.18	New River	9.06	Fayetteville	1.77
Texas	77.5	−2.7	Presidio	109	5	Follett	42	24	5.48	+2.52	Smithville	23.20	Dimmitt (near)	.21
Utah	68.4	+3.7	St. George	112	1 14	Silver Lake (Brighton).	21	8	.44	−.13	Green River	2.11	3 stations	.00
Virginia	72.9	+1.2	2 stations	98	1 7	Mountain Lake	35	4	3.87	−.32	Monterey	10.22	Clarendon	.69
Washington	64.0	+3.4	do	106	1 12	2 stations	29	1 7	.40	−1.21	Mountain Lakes	2.25	3 stations	.00
West Virginia	70.3	+.6	Institute	98	7	do	31	1 21	5.97	+1.53	Pickens	10.48	Kearneysville	1.28
Wisconsin	64.6	−.5	Prairie du Chien	98	18	Willow Reservoir	27	21	6.56	+2.47	Hancock	14.26	Iron River	1.15
Wyoming	61.8	+3.0	Green River	103	18	Jewett Ranch	16	10	1.38	−.24	Sundance	5.54	Green River	
Alaska (May)	46.4	+5.2	2 stations	85	1 14	3 stations	19	16	1.90	+.30	Little Port Walter	13.08	Nenana	.02
Hawaii	74.6	+1.6	Waianae (Oahu)	93	23	Haleakala (Maui)	36	21	3.26	−1.48	Kukiu	24.00	7 stations	.00
Puerto Rico	78.4	+.8	Dos Bocas	97	1 24	2 stations	58	1 2	5.85	−.28	Maricao	16.12	Coamo (near)	.61

1 Other dates also.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Maximum velocity: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F		°F	°F		°F	°F.	°F.	°F.	%	In.	In.		Miles								0-10	In.	In.
New England							62.3	−1.2										76	2.53	−0.5										5.6		
Eastport	75	67	85	29.77	29.85	−0.08	53.8	−1.3	72	30	62	42	9	46	26	49	47	84	2.20	−.8	15	9.5	sw.	35	e.	26	9	11	10	5.8	0.0	0.0
Greenville, Me	1,070	6		28.72	29.86		57.8		84	3	69	34	17	46	45	54	50		3.79		19		nw.							.0	.0
Portland, Me	103	82	117	29.75	29.87	−.08	60.4	−2.1	89	13	69	45	21	52	37	54	50	74	3.13	−.2	16	8.3	s.	29	nw.	13	12	10	8	4.8	.0	.0
Concord	288	54	72	29.51	29.88	−.08	63.9	+1.0	91	5	75	37	22	53	36	57	52	69	1.48	−1.7	12	6.1	se.	21	nw.	6	15	8	7	4.0	.0	.0
Burlington	403	11	48	29.42	29.85	−.11	62.5	−3.2	84	3	72	39	22	54	30	57	53	74	3.32	−.1	20	8.4	s.	27	s.	18	7	8	15	6.2	.0	.0
Northfield	876	12	60	28.94	29.88	−.08	60.4	−.9	85	5	71	32	22	50	37	56	52	73	2.18	−1.0	15	7.9	sw.	24	sw.	15	4	12	14	6.8	.0	.0
Boston [1]	125	106	165	29.85	29.88	−.08	65.1	−1.4	90	13	74	46	22	57	28	57	51	67	1.80	−1.1	13	11.0	w.	31	nw.	20	8	11	11	5.8	.0	.0
Nantucket	12	14	90	29.89	29.91	−.07	61.1	+.1	81	6	68	50	25	54	24	56	54	81	1.90	−.8	9	13.4	sw.	32	sw.	15	11	7	12	5.3	.0	.0
Block Island	26	11	46	.....	29.91	−.06	60.8	−1.0	77	4	67	51	22	55	.....	.....	.....	86	1.88	−.7	9	13.7	sw.	30	ne.	10	15	5	10	.....	.0	.0
Providence [1]	68	65	25	29.84	29.91	−.06	66.0	−2.3	92	13	76	47	21	56	29	58	54	74	2.22	−.5	11	10.7	nw.	33	nw.	20	11	10	9	5.2	.0	.0
Hartford [1]	159	122	.....	29.88	29.90	−.07	65.4	−1.7	89	13	76	41	22	55	31	60	56	78	4.32	+1.2	15	8.6	sw.	25	n.	20	5	14	11	6.5	.0	.0
New Haven [1]	13	74	68	29.90	29.92	−.05	66.0	−.6	91	13	74	47	22	58	29	59	56	77	3.36	+.3	13	8.0	s.	24	nw.	6	9	12	9	5.7	.0	.0
Middle Atlantic States							71.0	+0.7										71	2.53	−1.1										6.1		
Albany [1]	292	26	40	29.56	29.88	−.09	65.0	−3.0	91	5	75	37	22	55	33	59	54	71	2.83	−.5	17	9.4	s.	31	n.	20	5	11	14	6.7	.0	.0
Binghamton	871	57	79	29.00	29.91	−.06	65.4	−.2	90	4	76	38	22	55	37	59	55	71	3.75	+.4	18	6.0	sw.	21	w.	4	2	12	16	7.4	.0	.0
New York	314	415	454	29.58	29.91	−.07	68.4	−.4	91	4	77	50	21	60	27	60	54	68	3.11	−.2	13	13.1	w.	47	nw.	26	5	15	10	6.1	.0	.0
Harrisburg [1]	374	94	104	29.56	29.93	−.06	70.5	+.2	93	4	81	46	22	60	32	63	59	69	2.93	−.7	11	7.0	w.	29	nw.	30	5	13	12	6.1	.0	.0
Philadelphia	114	174	367	29.81	29.94	−.04	71.4	.0	91	4	80	51	21	62	24	63	58	67	2.52	−.7	10	11.3	sw.	35	nw.	30	5	15	10	6.1	.0	.0
Reading	323	47	306	29.58	29.93	.....	70.4	+.6	91	13	80	48	22	61	28	62	56	65	1.40	−2.2	10	10.3	nw.	34	nw.	29	9	11	10	5.9	.0	.0
Scranton	805	72	104	29.06	29.91	−.07	66.8	−1.0	91	4	77	41	22	57	32	59	53	66	3.71	.0	11	6.5	sw.	22	nw.	29	4	16	10	6.1	.0	.0
Atlantic City	52	37	172	29.88	29.93	−.05	69.2	+2.6	90	6	76	51	21	62	23	62	59	76	1.55	−1.5	6	13.3	s.	29	ne.	10	8	9	13	6.4	.0	.0
Sandy Hook	22	10	57	29.90	29.92	.....	67.6	−.2	89	4	74	52	21	61	23	62	58	78	4.16	+.4	13	11.7	w.	39	w.	26	6	16	8	6.0	.0	.0
Trenton	190	89	107	29.72	29.92	.....	69.7	+.2	92	4	79	49	22	60	27	61	56	69	1.90	−1.2	9	8.3	s.	27	nw.	30	4	13	13	6.5	.0	.0
Baltimore [2]	16	100	215	29.92	29.94	−.05	75.0	+2.3	94	4	84	53	21	66	25	66	62	70	2.37	−1.5	10	10.1	sw.	38	sw.	13	4	16	10	6.1	.0	.0
Washington	112	62	85	29.82	29.93	−.07	74.8	+2.6	93	24	84	51	22	66	30	65	60	66	.86	−3.3	8	6.2	sw.	24	nw.	29	5	16	9	6.2	.0	.0
Cape Henry	18	8	54	29.93	29.95	.....	75.6	+2.7	96	24	84	56	22	68	24	69	66	75	.81	−3.2	10	9.8	sw.	29	n.	29	9	13	8	5.4	.0	.0
Lynchburg	686	144	184	29.25	29.88	−.03	75.4	+.8	96	7	86	55	22	65	30	66	63	70	2.33	−1.5	15	6.4	w.	28	nw.	9	8	15	7	5.8	.0	.0
Norfolk [2]	91	80	125	29.87	29.96	−.04	77.0	+2.6	96	15	86	59	22	68	23	68	64	69	2.31	−1.9	11	8.7	sw.	30	w.	25	6	12	12	6.3	.0	.0
Richmond [2]	164	11	52	29.78	29.95	−.06	75.4	+1.3	93	6	85	54	21	66	27	68	65	77	3.78	−.1	13	7.0	sw.	29	nw.	24	8	13	9	5.3	.0	.0
Wytheville	2,304	49	55	.....	30.01	.00	68.8	+.1	88	6	79	45	21	58	.....	.....	.....	75	3.08	−1.1	15	6.1	w.	24	sw.	24	10	8	12	.....	.0	.0
South Atlantic States							78.3	+1.9										75	3.79	−0.8										5.6		
Asheville	2,253	89	104	27.73	30.02	+.01	71.6	+2.9	90	6	84	49	1	60	32	63	60	76	3.10	−.8	12	5.7	nw.	29	nw.	18	4	16	10	6.4	.0	.0
Charlotte [2]	769	63	86	29.18	29.98	−.03	78.2	+2.7	96	7	89	59	21	68	26	68	65	72	4.53	+.3	9	6.9	sw.	24	sw.	24	5	17	8	6.0	.0	.0
Greensboro [1]	886	6	56	29.07	29.99	.....	74.7	.....	93	14	86	54	1	64	27	68	65	75	2.99	.....	5	11.8	sw.	34	nw.	25	12	9	9	4.8	.0	.0
Hatteras	11	5	50	29.98	29.99	−.02	76.4	+.8	89	19	81	62	22	72	15	72	70	82	1.64	−2.9	5	8.0	sw.	26	w.	25	15	10	5	4.1	.0	.0
Raleigh [2]	358	103	146	29.60	29.98	−.03	78.4	+2.7	96	7	89	58	22	68	25	69	66	71	1.81	−2.6	10	9.2	sw.	24	s.	24	6	16	8	5.6	.0	.0
Wilmington	72	73	107	29.93	30.00	−.01	78.4	+1.6	96	7	86	61	26	71	24	72	69	79	5.06	.0	14	9.2	sw.	24	ne.	21	6	14	10	5.7	.0	.0
Charleston	48	11	92	29.97	30.02	+.01	80.8	+1.9	100	19	88	65	26	74	24	73	71	76	2.07	−2.5	5	10.0	sw.	24	ne.	21	6	14	10	5.7	.0	.0
Columbia, S. C. [2]	225	70	91	29.77	30.00	−.01	79.4	+1.3	96	14	90	62	26	69	26	71	68	74	4.21	.0	11	7.8	sw.	27	nw.	19	9	15	6	4.9	.0	.0
Greenville, S. C	1,040	70	78	28.92	30.00	.....	77.1	+3.0	95	6	88	56	1	66	27	67	63	66	2.02	−2.5	12	7.0	sw.	26	sw.	24	6	17	7	5.8	.0	.0
Augusta [2]	426	62	77	29.56	30.00	−.01	80.2	+1.5	96	18	90	60	1	70	29	70	66	70	3.61	−1.1	9	5.6	s.	30	sw.	24	8	11	11	6.0	.0	.0
Savannah [2]	51	73	152	29.97	30.02	+.01	80.6	+1.6	99	19	89	63	26	72	26	73	71	81	4.35	−.9	10	9.6	sw.	31	nw.	25	8	10	12	6.1	.0	.0
Jacksonville	43	86	110	29.99	30.04	+.03	80.4	+.5	98	20	89	65	26	72	26	74	72	82	9.34	+4.0	15	7.2	s.	33	w.	25	2	14	14	6.6	.0	.0
Florida Peninsula							81.9	+1.2										81	7.60	+1.5										5.7		
Key West [2]	21	10	64	29.99	30.00	+.01	83.2	+1.3	92	26	88	73	1	78	15	77	75	80	1.10	−3.1	8	9.8	e.	24	s.	1	11	13	6	4.8	.0	.0
Miami	25	124	168	30.01	30.04	+.04	81.2	+1.2	90	21	86	68	25	76	20	75	73	79	13.53	+6.7	9	8.3	se.	36	sw.	25	4	10	16	6.8	.0	.0
Tampa [2]	11	88	197	30.02	30.03	+.02	81.3	+1.1	95	21	89	66	26	73	23	75	73	84	8.17	+.9	15	9.0	se.	38	s.	4	7	17	6	5.5	.0	.0
East Gulf States							78.4	−0.3										77	5.99	+1.3										6.0		
Atlanta [1]	976	5	72	29.00	30.00	−.01	77.4	+1.4	96	7	89	56	30	66	30	68	65	71	3.41	.....	10	8.0	w.	45	sw.	24	5	13	12	6.4	.0	.0
Macon [2]	464	79	87	29.52	30.00	−.01	78.8	−.1	95	19	89	58	1	68	29	70	66	74	4.81	+.8	11	6.3	s.	24	sw.	24	7	12	11	5.8	.0	.0
Thomasville	273	49	58	29.77	30.06	+.06	78.0	−1.5	96	19	87	63	1	69	24	73	71	...	4.66	.....	15	.....	s.	.....	.....	.....	.....	.....	.....	.....	.....	.0	.0
Apalachicola	35	11	51	29.98	30.01	.....	80.4	+.6	96	20	86	67	1	74	18	75	72	77	2.78	−2.8	7	8.1	sw.	26	e.	21	5	11	14	6.3	.0	.0
Pensacola	56	54	79	29.95	30.01	+.02	79.4	+.1	95	21	85	66	2	74	21	74	72	80	5.89	+1.2	13	8.3	s.	24	se.	5	11	12	7	5.3	.0	.0
Anniston	741	9	.....	29.26	30.04	+.04	76.4	+1.4	92	19	87	54	2	65	30	.....	.....	...	5.03	+.9	10	.....	sw.	.....	.....	.....	11	16	3	.....	.....	.0	.0
Birmingham [2]	630	11	48	29.35	30.01	+.02	76.4	−1.5	90	19	86	59	2	67	26	68	65	74	4.27	−.2	14	6.3	s.	22	sw.	11	11	11	8	5.2	.0	.0
Mobile [2]	29	86	161	29.97	30.00	+.01	79.0	−1.3	93	21	86	64	2	72	23	73	71	84	12.49	+7.1	16	9.7	s.	29	se.	16	5	13	12	6.5	.0	.0
Montgomery [2]	237	92	105	29.76	30.01	+.01	79.0	−.6	93	19	88	63	26	70	26	70	68	76	6.24	+2.4	10	6.4	se.	21	s.	24	7	11	12	6.1	.0	.0
Meridian [2]	310	67	92	29.67	29.99	+.01	77.4	−.7	93	22	87	58	2	68	29	71	69	82	6.40	+1.8	15	5.7	sw.	26	sw.	7	10	8	12	5.7	.0	.0
Vicksburg	247	82	102	29.71	29.96	−.01	77.4	−1.6	93	22	86	64	1	69	23	71	68	77	4.77	+.8	13	7.8	e.	30	sw.	9	7	11	12	6.0	.0	.0
New Orleans [2]	30	76	84	29.94	29.97	−.01	80.6	.0	94	22	87	69	13	74	22	73	71	79	7.21	+1.3	16	6.2	se.	21	ne.	20	6	12	12	6.4	.0	.0
Port Eads, La	9	4	35	29.97	29.98	.....	79.8	.....	90	20	86	66	2	74	18	.....	.....	...	3.86	.....	9	9.5	s.	35	.....	11	.....	.....	.....	6.4	.0	.0
West Gulf States							78.2	−1.4										76	5.32	+1.7										5.4		
Shreveport [2]	181	92	227	29.75	29.95	−.01	78.4	−2.3	95	20	87	64	13	70	25	71	69	79	5.53	+2.0	12	9.0	s.	38	s.	9	12	11	7	4.7	.0	.0
Bentonville	1,303	12	51	28.60	29.94	.00	73.0	−1.1	92	27	84	53	1	62	31	.....	.....	...	5.86	+1.6	11	5.8	s.	24	w.	8	9	13	8	5.0	.0	.0
Fort Smith	463	57	82	29.48	29.95	+.01	76.8	−.7	95	27	87	59	12	66	30	68	63	68	4.01	+.3	10	7.4	e.	26	nw.	8	6	16	8	5.8	.0	.0
Little Rock [2]	265	94	102	29.68	29.96	.00	76.0	−1.4	91	5	85	60	12	67	27	70	67	79	2.26	−1.5	12	7.1	s.	24	n.	28	4	11	15	6.7	.0	.0
Austin [2]	605	68	90	29.26	29.90	.....	77.7	−3.5	96	27	87	59	26	68	34	70	67	76	8.83	+6.4	13	6.9	s.	19	ne.	29	10	15	5	5.0	.0	.0
Brownsville [2]	20	88	96	29.86	29.88	.....	82.0	−.4	94	10	90	68	11	74	21	74	71	79	1.68	−1.2	9	10.1	se.	24	s.	23	4	20	6	5.6	.0	.0
Corpus Christi [2]	44	11	78	29.85	29.90	−.01	81.2	+.2	90	28	87	67	10	76	19	74	72	83	2.84	+.2	7	10.7	se.	32	ne.	10	12	14	4	4.2	.0	.0
Dallas [2]	488	220	227	29.40	29.91	.....	76.4	.....	93	7	85	58	11	68	26	69	66	74	6.72	+2.6	14	10.4	s.	35	sw.	8	8	14	8	5.2	.0	.0
Fort Worth [1]	706	35	56	29.19	29.92	.00	76.8	−3.4	94	7	86	59	11	67	29	68	65	75	7.30	+4.0	17	9.8	s.	31	n.	28	6	6	18	6.9	.0	.0
Galveston [2]	9	106	114	29.92	29.92	−.03	80.3	−.4	88	17	84	71	10	76	15	74	71	76	2.42	−2.0	9	9.9	s.	28	s.	10	13	13	4	4.5	.0	.0
Houston	62	157	190	29.86	29.92	.....	80.2	−1.2	92	21	88	66	13	72	21	72	69	79	7.21	+2.6	8	8.8	se.	30	se.	5	7	14	9	5.5	.0	.0
Palestine	510	64	72	29.42	29.94	.00	77.0	−2.0	92	27	85	62	11	69	23	70	66	75	6.69	+3.1	13	6.5	s.	20	s.	9	8	16	6	5.1	.0	.0
Port Arthur	34	59	134	29.90	29.94	.....	80.1	.....	95	21	87	67	13	73	21	73	71	77	5.59	+.8	13	11.3	s.	38	sw.	10	8	13	9	5.6	.0	.0
San Antonio [2]	552	111	301	29.30	29.90	.00	79.6	−1.4	95	8	89	60	15	70	28	71	68	74	7.47	+5.0	12	10.2	se.	38	w.	14	4	20	6	5.8	.0	.0

See footnotes at end of table.

Climatological data for Weather Bureau stations—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with .01, or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Ohio Valley and Tennessee							**73.7**	**+0.9**										**72**	**3.68**	**−0.2**									**5.6**		
Chattanooga [3]	688	71	214	29.29	30.00	0.00	76.8	+1.4	95	6	87	56	2	66	28	68	64	74	5.37	+1.2	13	7.0	w.	34	w.	23	6	15	9	5.7	0.0	0.0
Knoxville [3]	980	66	84	28.98	30.00	.00	75.6	+1.6	93	7	86	55	1	65	28	67	63	71	4.48	+.4	9	5.5	sw.	20	nw.	21	11	15	4	4.2	.0	.0
Memphis [3]	284	78	86	29.66	29.95	−.02	77.1	−.5	95	5	85	61	24	69	25	69	65	73	2.78	−.8	9	7.2	sw.	30	sw.	7	8	14	8	5.4	.0	.0
Nashville [3]	605	168	188	29.34	29.98	−.01	75.9	+.3	93	6	85	55	2	67	32	68	63	70	2.84	−1.2	11	7.7	s.	34	s.	10	9	14	7	5.2	.0	.0
Lexington	989	6	.....	.....	29.97	−.03	73.2	+1.0	94	6	85	48	2	61	35	.....	.....	.....	2.98	.....	18	.....	sw.	.....	.....	.....	12	13	5	4.1	.0	.0
Louisville [3]	545	106	120	29.38	29.96	−.02	74.8	+.1	92	6	84	52	2	66	28	66	62	71	1.59	−2.2	10	8.6	sw.	30	sw.	23	10	13	7	4.8	.0	.0
Evansville	431	76	116	29.50	29.95	−.02	76.0	+.9	92	5	85	54	21	67	29	66	62	66	2.70	−1.3	9	8.3	sw.	51	sw.	28	9	13	8	5.6	.0	.0
Indianapolis [3]	808	98	129	29.08	29.93	−.04	73.9	+2.3	94	6	84	47	21	64	31	65	61	73	1.88	−1.7	11	7.6	sw.	28	nw.	7	6	11	13	6.2	.0	.0
Terre Haute	575	63	149	29.32	29.93	.....	74.5	.....	95	6	84	48	21	64	30	65	59	64	2.99	−.9	12	8.8	sw.	28	sw.	28	8	16	6	5.3	.0	.0
Cincinnati [3]	497	11	51	29.42	29.94	−.05	73.0	+1.8	93	6	83	49	21	63	28	66	63	73	3.87	+.2	16	6.5	sw.	25	w.	23	6	11	13	6.1	.0	.0
Columbus [3]	833	90	110	29.07	29.93	−.06	72.8	+1.9	92	6	82	50	21	63	29	65	61	74	3.79	+.5	13	9.5	s.	36	sw.	24	8	12	10	6.1	.0	.0
Dayton	900	186	213	29.00	29.93	.....	72.5	+1.1	90	7	81	50	21	64	25	64	60	68	1.94	−1.8	12	9.7	sw.	37	sw.	23	8	11	11	5.9	.0	.0
Elkins [3]	2,006	61	78	27.92	29.98	−.02	68.0	+1.1	89	7	78	39	21	58	35	62	60	83	4.75	−.3	17	5.9	w.	24	w.	29	2	11	17	7.4	.0	.0
Parkersburg	637	77	84	29.28	29.96	−.04	72.6	+1.2	93	7	83	48	21	62	30	65	61	73	6.36	+2.4	18	5.7	se.	21	w.	24	5	18	7	5.6	.0	.0
Pittsburgh [1]	1,273	39	54	28.61	29.94	−.05	69.4	−1.3	90	7	79	45	21	60	29	62	59	73	6.23	+2.4	17	10.0	sw.	34	w.	30	4	14	12	6.4	.0	.0
							66.7	**0.0**										**74**	**3.84**	**+0.5**									**6.0**		
Lower Lake Region																															
Buffalo [3]	706	243	280	29.15	29.90	−.07	63.0	−1.4	88	10	70	45	21	56	26	59	55	73	4.44	+1.6	12	14.6	sw.	49	sw.	25	5	15	10	6.0	.0	.0
Canton	448	10	61	29.38	29.84	.....	63.2	−1.9	84	5	73	40	22	53	34	58	54	74	7.00	+3.7	16	8.1	sw.	24	w.	15	3	11	16	6.9	.0	.0
Ithaca	836	77	100	29.00	29.89	.....	65.4	−.8	90	4	76	39	23	55	39	.....	.....	.....	4.37	+.8	13	8.1	nw.	23	nw.	29	6	11	13	6.5	.0	.0
Oswego	335	71	85	29.52	29.88	−.09	61.7	−3.1	85	5	71	44	20	53	31	58	54	76	3.70	+.4	14	8.0	w.	23	se.	10	10	9	11	5.6	.0	.0
Rochester [3]	555	86	102	29.30	29.89	−.08	66.0	−.1	90	7	75	45	20	57	34	61	58	78	2.52	−.5	13	8.7	sw.	25	w.	29	4	15	11	8.3	.0	.0
Syracuse [3]	408	65	79	29.45	29.88	−.09	66.1	+.5	89	5	75	43	23	57	32	60	56	72	3.27	−.6	15	7.2	s.	22	nw.	20	4	13	13	6.5	.0	.0
Erie	714	57	81	29.15	29.90	−.08	66.8	+.6	87	7	74	48	20	59	26	62	58	74	2.73	−.6	14	7.6	sw.	23	sw.	25	9	15	6	5.4	.0	.0
Cleveland [3]	805	267	318	29.06	29.92	−.06	69.0	+1.9	86	5	76	51	1	61	25	63	58	71	3.68	+.6	15	12.9	sw.	39	nw.	20	8	12	10	5.8	.0	.0
Sandusky	629	5	67	29.24	29.91	−.07	70.3	+1.5	94	7	80	51	20	61	29	.....	.....	.....	3.66	+.2	16	8.5	sw.	24	sw.	24	9	11	10	5.9	.0	.0
Toledo [3]	628	79	87	29.24	29.91	−.06	70.2	+1.5	89	7	79	48	21	61	26	64	60	77	3.41	+.1	15	9.6	w.	35	w.	24	12	15	3	4.3	.0	.0
Fort Wayne [3]	828	69	84	29.04	29.92	.....	70.9	+1.6	90	6	80	49	21	62	27	64	60	75	4.07	+.5	13	8.6	sw.	27	sw.	24	6	12	12	6.4	.0	.0
Detroit [1]	626	5	78	29.24	29.90	−.07	67.6	+.2	90	7	78	45	21	57	29	61	58	73	3.27	−.3	12	9.7	w.	34	sw.	24	7	13	10	6.1	.0	.0
							62.2	**−0.4**										**74**	**4.20**	**+0.8**									**6.0**		
Upper Lake Region																															
Alpena	609	13	80	29.21	29.88	−.08	60.6	+.2	92	3	69	40	21	52	37	55	51	73	2.86	−.4	12	11.3	nw.	31	nw.	29	6	14	10	6.2	.0	.0
Escanaba	612	51	72	29.22	29.88	−.06	59.0	−1.7	78	18	67	39	20	51	26	54	51	77	4.88	+1.7	14	10.9	s.	35	n.	13	4	12	14	6.6	.0	.0
Grand Rapids [3]	689	70	244	29.15	29.88	−.09	68.2	+.4	90	6	78	46	21	59	31	61	57	74	3.06	−.4	16	10.5	sw.	42	s.	22	9	11	10	5.3	.0	.0
Lansing	878	5	90	28.97	29.89	.....	66.4	.0	88	7	76	42	21	57	29	61	58	77	5.70	+2.2	14	8.1	sw.	23	sw.	24	8	13	9	5.7	.0	.0
Marquette	734	44	73	29.07	29.87	−.07	57.4	−1.5	89	2	67	40	11	48	39	52	47	72	4.54	+1.3	12	8.0	nw.	30	sw.	14	4	13	13	6.3	.0	.0
Sault Sainte Marie [3]	724	11	52	29.08	29.86	−.10	56.2	−2.4	84	2	66	37	14	47	41	51	48	79	4.13	+1.2	14	8.5	nw.	30	nw.	19	5	10	15	6.7	.0	.0
Chicago	673	7	131	29.19	29.90	−.06	67.4	+.1	92	6	77	47	21	58	34	60	55	70	1.31	−2.0	13	9.6	sw.	31	nw.	24	9	10	11	5.4	.0	.0
Green Bay	617	109	141	29.21	29.87	−.08	64.4	−.5	88	17	73	45	21	55	32	58	54	71	6.11	+2.4	15	11.0	s.	30	w.	28	5	14	11	6.3	.0	.0
Milwaukee [3]	698	126	221	29.15	29.90	−.05	64.9	+1.0	88	3	74	48	20	56	30	58	54	73	7.54	+4.1	11	12.0	w.	34	w.	28	5	14	11	6.5	.0	.0
Duluth	1,133	5	47	28.67	29.87	−.05	57.6	+.4	86	14	68	39	20	47	44	52	47	71	1.84	−2.1	13	11.6	ne.	45	nw.	2	9	10	11	5.5	.0	.0
							63.1	**+0.0**										**64**	**2.02**	**−1.8**									**4.8**		
North Dakota																															
Moorhead, Minn. [3]	899	50	58	28.91	29.87	−.03	63.3	−1.1	93	18	75	39	20	51	37	56	51	67	1.75	−2.3	9	8.8	n.	24	n.	2	9	11	10	5.6	.0	.0
Bismarck [1]	1,660	4	41	28.16	29.90	+.03	64.4	+.7	93	16	78	41	7	50	42	56	49	60	2.13	−1.2	9	12.3	nw.	49	nw.	2	12	13	5	4.6	.0	.0
Devils Lake	1,478	11	44	28.35	29.90	+.02	61.4	−.5	89	17	74	36	19	49	36	54	47	64	1.80	−1.8	14	8.9	nw.	30	nw.	14	8	14	8	5.6	.0	.0
Grand Forks	832	12	67	28.99	29.89	.....	62.4	−.6	92	17	77	32	20	48	42	55	50	.....	.85	−2.5	8	.....	nw.	.....	.....	.....	3	11	16	.....	.0	.0
Lemmon, S. Dak	1,457	11	71	27.23	29.91	.....	64.8	.....	97	17	78	42	10	51	42	54	47	.....	1.30	.....	5	.....	se.	.....	.....	.....	.....	.....	.....	.....	.0	.0
Williston	1,878	42	50	27.95	29.89	+.03	64.0	+1.3	91	13	75	45	28	53	37	55	49	63	2.38	−1.0	11	8.1	se.	29	nw.	1	20	5	5	3.6	.0	.0
							72.5	**+1.9**										**66**	**3.66**	**−0.4**									**5.7**		
Upper Mississippi Valley																															
Minneapolis-St. Paul, Minn. [1]	838	32	61	28.97	29.86	−.06	68.0	+.5	93	2	78	49	20	58	31	60	54	65	7.10	+2.9	14	10.3	nw.	31	nw.	28	8	8	14	6.1	.0	.0
Springfield, Minn	1,025	4	42	28.80	29.87	.....	68.6	.....	97	2	80	44	11	57	37	60	55	.....	4.98	.....	13	.....	nw.	.....	.....	.....	.....	.....	.....	.....	.0	.0
La Crosse [3]	672	11	48	29.16	29.87	−.06	69.6	+1.3	93	17	79	47	21	60	32	61	57	71	4.65	+.6	11	8.4	nw.	17	nw.	24	6	8	16	6.5	.0	.0
Madison [3]	866	70	73	28.97	29.89	−.05	68.1	+.9	90	6	77	48	21	59	30	61	56	70	4.95	+1.2	13	7.5	s.	26	n.	24	5	14	11	6.2	.0	.0
Charles City	1,015	10	51	28.83	29.90	−.01	69.7	+3.2	94	22	81	49	20	59	36	61	56	65	3.53	−1.1	10	6.5	sw.	22	sw.	22	12	12	6	4.4	.0	.0
Davenport [3]	606	66	161	29.27	29.91	−.03	73.8	+3.3	93	17	84	52	21	64	27	64	58	64	2.65	−1.5	7	9.7	sw.	30	w.	18	7	14	9	5.9	.0	.0
Des Moines [3]	963	5	99	28.88	29.89	−.03	73.7	+3.1	97	18	84	55	29	63	30	62	57	64	1.68	−3.1	7	10.2	sw.	30	w.	2	8	9	10	15.8	.0	.0
Dubuque	699	60	79	29.15	29.88	−.05	71.4	+2.0	93	18	82	53	21	61	30	63	58	66	6.48	+2.2	11	6.1	nw.	32	nw.	18	7	8	15	6.4	.0	.0
Keokuk	614	64	78	29.26	29.90	−.04	74.7	+2.2	92	6	84	55	21	65	28	65	59	62	2.18	−2.0	7	7.5	sw.	34	sw.	6	5	17	8	5.9	.0	.0
Cairo	358	87	93	29.58	29.95	−.02	75.4	−.9	92	26	84	58	1	67	30	67	63	69	3.17	−.7	10	7.0	s.	43	n.	28	8	9	13	6.0	.0	.0
Peoria [3]	662	11	45	29.21	29.91	−.04	73.4	+2.5	94	6	85	51	21	62	31	65	60	68	3.30	−.5	8	5.3	s.	17	sw.	28	18	9	3	3.4	.0	.0
Springfield, Ill. [3]	613	5	191	29.27	29.92	−.03	75.7	+3.5	95	6	86	50	21	68	29	65	61	69	1.53	−2.5	8	10.4	s.	30	nw.	28	4	12	14	6.6	.0	.0
St. Louis [3]	564	179	303	29.34	29.93	−.02	76.2	+1.2	94	6	85	58	21	67	28	65	59	59	2.66	−1.2	6	11.2	sw.	40	s.	11	12	9	9	5.0	.0	.0
							72.5	**+1.4**										**65**	**3.69**	**−0.7**									**5.4**		
Missouri Valley																															
Columbia, Mo. [3]	785	6	66	29.10	29.93	−.02	74.0	+1.2	93	6	84	55	25	64	31	66	62	71	5.91	+1.2	8	6.5	s.	21	s.	4	10	16	4	4.8	.0	.0
Kansas City [1]	750	38	76	29.11	29.90	−.02	74.7	+1.1	93	30	84	55	24	65	29	66	60	65	3.84	−1.2	8	10.4	sw.	34	nw.	6	4	15	11	6.3	.0	.0
St. Joseph [3]	817	11	49	29.04	29.90	.....	73.8	+.1	95	30	84	55	29	64	30	66	62	74	4.72	−.2	9	8.0	s.	28	nw.	23	12	11	7	4.9	.0	.0
Springfield, Mo. [3]	1,360	5	78	28.53	29.94	−.01	72.0	−.5	93	27	84	50	29	60	33	65	62	75	2.51	−2.2	8	7.4	s.	24	sw.	26	10	9	11	5.6	.0	.0
Topeka	987	65	87	28.88	29.89	.....	75.2	+1.8	103	26	87	54	24	64	38	65	60	63	2.76	−1.9	8	8.8	s.	27	nw.	6	4	12	14	7.1	.0	.0
Lincoln [3]	1,189	11	81	28.64	29.87	−.03	73.7	+2.3	103	18	86	52	29	62	35	62	56	60	2.11	−2.2	7	9.8	s.	37	w.	8	9	11	10	5.4	.0	.0
Omaha [1]	982	31	44	28.86	29.89	−.02	73.3	+1.7	102	18	84	53	29	62	35	63	58	64	3.06	−1.5	8	11.0	s.	35	nw.	27	8	10	12	5.9	.0	.0
Valentine	2,598	46	54	27.22	29.89	+.03	68.8	+1.9	102	1	82	44	24	55	48	57	49	57	1.88	−1.0	8	10.2	e.	33	nw.	22	15	10	5	4.0	.0	.0
Sioux City [3]	1,138	64	106	28.73	29.88	−.02	71.6	+2.1	97	17	83	52	11	61	34	62	56	63	7.40	+3.4	9	10.0	s.	35	w.	3	9	13	8	5.5	.0	.0
Huron [1]	1,289	26	41	28.53	29.88	.00	68.3	+2.1	100	2	82	46	11	55	40	59	51	62	2.75	−1.0	11	13.4	nw.	44	nw.	26	14	10	6	4.3	.0	.0
							65.5	**+4.4**										**54**	**1.75**	**−0.5**									**4.7**		
Northern Slope																															
Billings [1]	3,570	18	39	26.30	29.92	.....	66.6	.....	97	20	80	41	8	53	42	54	45	54	2.49	.....	10	10.6	sw.	49	nw.	20	9	13	8	5.4	.0	.0
Havre	2,507	11	67	27.32	29.92	+.07	65.3	+3.3	92	25	78	45	9	52	39	53	44	55	3.57	+.7	10	8.8	e.	35	nw.	1	9	6	15	6.1	.0	.0
Helena	4,124	85	111	26.02	29.94	+.06	63.9	+4.7	93	25	79	36	23	49	46	51	42	52	1.46	−.9	8	9.0	w.	50	sw.	13	12	11	7	4.5	.0	.0
Missoula [3]	3,189	80	91	.....	29.89	.....	65.7	+5.7	98	12	81	43	9	51	46	51	40	54	1.14	−.8	8	6.3	nw.	26	w.	13	8	13	9	5.5	.0	.0
Kalispell	2,973	48	56	26.93	29.93	+.04	63.0	+5.3	94	12	76	41	23	50	41	50	39	50	.83	−1.2	7	6.3	w.	23	w.	20	9	15	6	4.9	.0	.0
Miles City [3]	2,634	48	55	27.18	29.88	+.03	68.6	+2.6	97	13	80	46	10	57	37	57	51	64	2.48	−.2	11	7.2	nw.	40	nw.	22	18	9	3	3.1	.0	.0
Rapid City [3]	3,218	50	58	26.64	29.90	+.05	67.8	+3.6	98	17	80	44	11	56	38	58	47	54	1.91	−1.4	7	8.7	n.	29	nw.	8	9	15	6	4.9	.0	.0
Cheyenne [1]	6,144	5	39	24.00	29.88	+.04	64.8	+4.4	94	17	80	32	10	49	48	50	39	46	.37	−1.2	7	10.7	nw.	42	nw.	30	13	14	3	4.2	.0	.0
Lander	5,352	60	68	24.66	29.85	.00	66.3	+5.8	97	19	82	36	10	50	42	51	40	45	.36	−.8	4	5.8	sw.	30	e.	30	13	14	3	4.2	.0	.0
Sheridan [1]	3,790	10	47	25.93	29.90	.....	65.1	.....	100	20	81	35	10	49	50	54	46	56	1.85	−.2	8	5.2	nw.	27	nw.	20	9	14	7	4.8	.0	.0
Yellowstone Park	6,241	12	46	23.95	30.01	+.05	57.8	+4.4	87	19	73	32	8	43	42	47	39	59	2.47	+.8	10	7.1	sw.	25	w.	17	11	10	9	5.2	3.2	.0
North Platte [3]	2,787	11	51	27.04	29.86	.00	72.1	+4.6	99	30	86	45	24	58	43	59	50	56	2.84	−.4	5	8.5	s.	31	sw.	1	21	5	4	3.0	.0	.0

See footnotes at end of table.

Climatological data for Weather Bureau stations—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Miles per hour: Direction	Wind: Miles per hour: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Middle Slope							**73.3**	**+1.5**										**57**	**2.19**	**−0.9**								**5.1**		
Denver [2]	5,332	106	113	24.72	29.87	+0.03	70.4	+4.1	94	17	83	46	10	58	36	52	40	44	.22	−1.2	4	7.7	s.	27	ne.	22	11	12	7	4.8	0.0	0.0
Pueblo [2]	4,806	79	86	25.18	29.85	+.02	71.0	+2.0	96	25	86	45	11	56	43	54	43	46	.39	−1.0	5	6.5	e.	30	w.	21	11	17	2	4.4	.0	.0
Concordia	1,392	50	58	28.45	29.88	−.02	74.6	+1.6	100	27	86	53	21	63	35	64	57	60	1.08	−3.3	10	8.5	sw.	26	nw.	27	8	11	11	5.5	.0	.0
Dodge City	2,509	10	86	27.34	29.88	+.01	73.0	+.5	104	27	86	48	24	60	38	61	54	58	3.53	+.2	19	11.4	s.	49	nw.	6	11	15	4	4.7	.0	.0
Wichita [2]	1,392	85	93	28.46	29.89	−.02	75.4	+1.0	102	26	86	53	24	65	33	65	60	66	4.85	+.5	6	10.2	se.	32	nc.	17	9	14	7	5.2	.0	.0
Oklahoma City [2]	1,304	10	47	28.57	29.91	.00	75.6	−.4	96	8	86	54	11	65	32	66	61	67	3.05	−.6	6	8.9	s.	28	nw.	28	5	17	8	5.9	.0	.0
Chadron, Nebr	3,439	4	58	26.42	29.86	.....	70.6	.....	101	17	85	41	9	56	44	56	45	...	1.09	.....	6	.....	ne.	...	...	...	...	...	...	.0	.0
Southern Slope							**75.9**	**−2.0**										**62**	**3.73**	**+1.2**								**5.1**		
Abilene [1]	1,750	10	56	28.10	29.88	.00	76.5	−2.7	95	28	87	55	11	66	34	66	63	72	3.93	+.9	12	9.7	s.	30	sw.	8	8	8	14	5.9	.0	.0
Amarillo [2]	3,604	10	49	26.31	29.87	+.02	73.4	+.6	98	26	86	53	11	61	34	60	53	61	1.64	−1.2	4	9.3	se.	24	se.	2	15	15	0	3.4	.0	.0
Del Rio	960	63	71	28.88	29.84	−.01	79.4	−4.0	94	18	89	61	13	70	31	69	65	66	5.13	+2.6	8	9.4	se.	32	ne.	9	3	17	10	6.3	.0	.0
Roswell	3,566	75	85	26.33	29.86	+.06	74.2	−2.1	99	2	88	49	12	60	39	59	49	50	4.20	+2.5	8	7.6	s.	36	ne.	10	10	13	7	4.9	.0	.0
Southern Plateau							**76.9**	**+2.9**										**36**	**0.73**	**+0.3**								**3.7**		
El Paso [2]	3,916	82	101	25.99	29.79	+.04	79.2	−.4	100	18	92	60	12	67	36	59	46	40	1.87	+1.3	7	8.9	e.	28	n.	10	18	9	3	3.7	.0	.0
Albuquerque [1]	5,314	5	34	24.74	29.81	.....	73.4	+.8	97	18	87	54	6	59	36	54	40	37	1.32	+.8	7	9.3	se.	37	e.	18	13	12	5	4.7	.0	.0
Santa Fe	7,013	38	53	23.30	29.87	+.06	65.7	+.9	87	18	78	40	10	53	33	48	35	40	1.17	+.1	5	6.2	e.	20	e.	12	10	12	8	5.1	.0	.0
Flagstaff	6,907	10	59	23.39	29.79	+.01	63.8	+4.5	92	18	81	35	5	46	49	46	32	39	1.18	.....	7	8.2	nw.	29	nw.	15	10	14	6	4.5	.0	.0
Phoenix [1]	1,112	39	87	28.60	29.71	−.03	88.9	+4.4	115	19	104	66	8	74	39	63	44	27	T	−.1	0	6.6	w.	26	ne.	26	20	6	4	3.2	.0	.0
Yuma	142	9	54	29.59	29.72	−.02	88.0	+3.3	115	13	105	61	7	71	44	66	51	35	T	.0	0	5.4	sw.	23	se.	21	28	1	1	.9	.0	.0
Independence	3,957	5	26	25.90	29.84	+.06	78.9	+6.6	102	14	94	55	1	64	38	54	32	...	.0	−.1	0	.....	n.	20	n.	8	...	...	...	...	.0	.0
Middle Plateau							**71.9**	**+6.4**										**35**	**0.37**	**−0.1**								**3.0**		
Ely, Nev. [1]	6,262	5	41	.....	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reno [2]	4,400	61	76	25.58	29.91	+.05	70.6	+8.2	99	16	87	43	9	54	42	52	41	51	.79	+.5	4	6.5	w.	26	w.	16	23	5	2	2.2	.0	.0
Tonopah	6,090	12	20	24.07	29.85	.....	72.4	.....	96	14	86	42	8	59	35	50	29	...	.01	.....	1	.....	nw.	...	...	...	24	6	0	...	.0	.0
Winnemucca	4,344	18	58	25.59	29.89	+.01	70.3	+7.5	104	16	89	37	8	52	51	50	33	34	.44	−.3	5	6.9	ne.	27	nw.	30	22	3	5	2.7	.0	.0
Modena	5,473	10	46	24.60	29.82	.00	68.0	+4.7	97	18	87	36	6	49	47	47	27	27	.30	.0	2	10.7	sw.	43	nw.	4	14	13	3	3.7	.0	.0
Salt Lake City [2]	4,227	86	210	25.70	29.85	.00	74.0	+6.6	103	18	88	45	8	60	36	53	38	37	.26	−.5	4	7.6	n.	38	nw.	7	16	11	3	2.9	.0	.0
Grand Junction	4,602	60	68	25.33	29.82	−.01	76.6	+5.2	102	18	91	49	9	62	35	54	34	26	.07	−.3	1	7.1	se.	35	s.	29	14	14	2	3.3	.0	.0
Northern Plateau							**69.0**	**+5.4**										**41**	**0.30**	**−0.8**								**3.6**		
Baker [2]	3,373	36	54	26.55	29.98	+.03	63.7	+5.1	97	12	80	36	8	47	47	50	42	58	.68	−.7	3	6.3	n.	19	s.	12	16	11	3	3.5	.0	.0
Boise [1]	2,858	5	49	27.00	29.89	−.02	69.6	.....	109	19	85	40	8	54	44	53	38	38	.08	.....	1	10.1	nw.	43	nw.	7	19	5	6	3.3	.0	.0
Pocatello [1]	4,478	5	31	25.46	29.88	+.01	68.1	.....	103	19	85	35	9	52	47	50	34	37	.38	.....	6	10.6	w.	38	w.	7	13	12	5	4.0	.0	.0
Spokane [2]	1,968	101	110	27.90	29.94	.00	68.3	+5.5	97	19	82	46	5	55	37	53	40	46	.36	−.9	3	6.8	s.	21	s.	20	14	11	5	3.7	.0	.0
Walla Walla	991	57	65	28.90	29.96	.00	72.4	+5.9	102	24	86	51	5	59	40	54	38	33	.09	−1.0	2	6.1	s.	21	sw.	19	13	11	6	4.0	.0	.0
Yakima	1,076	58	67	28.83	29.96	.....	71.6	+5.2	100	24	86	49	2	57	39	54	39	36	.06	−.5	1	7.8	nw.	27	sw.	12	16	8	6	3.4	.0	.0
North Pacific Coast Region							**63.0**	**+3.7**										**66**	**0.34**	**−1.3**								**4.3**		
North Head	211	11	5	29.90	30.12	+.13	55.2	+.4	81	11	59	48	28	51	28	53	51	88	.35	−1.9	7	17.6	n.	34	s.	12	9	14	7	5.1	.0	.0
Seattle [2]	14	90	321	30.05	30.08	+.08	64.4	+5.4	86	24	74	50	22	54	29	54	47	62	.34	−1.0	3	8.3	ne.	25	sw.	6	11	13	6	4.3	.0	.0
Tacoma	194	172	201	29.88	30.08	+.05	62.4	+3.7	82	11	72	46	7	53	28	...	...	...	.21	−1.2	2	8.3	n.	21	sw.	12	10	14	6	4.5	.0	.0
Tatoosh Island	86	9	61	30.03	30.13	+.11	54.8	+1.8	79	11	59	48	21	51	27	52	50	85	.49	−2.7	5	9.9	sw.	38	s.	12	10	14	6	5.1	.0	.0
Medford [1]	1,329	29	58	28.59	29.97	.....	70.0	+4.8	100	24	87	40	5	53	46	57	44	53	.62	−.1	4	.....	nw.	...	...	...	17	8	5	3.4	.0	.0
Portland, Oreg. [2]	39	68	106	30.01	30.06	+.02	67.5	+5.1	97	11	79	46	5	56	35	56	48	57	.06	−1.5	2	7.1	nw.	17	nw.	14	12	9	9	4.5	.0	.0
Roseburg	510	45	76	29.49	30.03	.00	67.0	+4.5	102	11	82	41	5	52	45	55	46	53	.30	−.8	1	5.6	n.	15	n.	20	18	5	7	3.4	.0	.0
Middle Pacific Coast Region							**67.5**	**+3.2**										**62**	**0.16**	**−0.3**									**3.8**	
Eureka	60	72	88	29.98	30.05	.00	54.4	+.1	61	1	59	46	5	50	15	51	49	86	.32	−.4	1	7.6	n.	25	n.	5	8	7	15	6.3	.0	.0
Redding [1]	722	20	34	29.09	29.86	.....	81.6	+6.5	108	15	95	56	2	69	33	60	44	32	.31	−.5	2	8.2	nw.	21	n.	7	20	4	6	2.8	.0	.0
Sacramento [2]	25	92	115	29.82	29.84	−.05	73.0	+5.6	104	14	92	53	2	58	44	60	50	52	T	−.2	0	7.6	s.	20	sw.	16	24	5	1	1.2	.0	.0
San Francisco	155	112	132	29.75	29.92	−.04	59.0	+.5	72	8	64	51	13	54	18	54	52	81	.01	−.2	1	10.4	w.	24	w.	3	11	13	6	4.7	.0	.0
South Pacific Coast Region							**70.5**	**+1.8**										**64**	**T**	**−0.1**								**3.9**		
Fresno [1]	327	89	98	29.53	29.82	−.03	80.4	+4.6	107	14	98	56	2	63	41	62	48	40	T	−.1	0	7.5	nw.	22	nw.	18	25	4	1	1.2	.0	.0
Los Angeles	512	223	250	29.37	29.91	+.01	66.0	−.4	81	13	75	55	17	57	25	59	55	74	T	−.1	0	5.9	w.	17	w.	18	12	16	2	4.2	.0	.0
San Diego [2]	28	62	70	29.88	29.92	.00	65.2	+1.3	75	1	70	57	1	60	18	60	57	77	T	.0	0	7.5	w.	17	nw.	1	5	13	12	6.3	.0	.0
West Indies																																
San Juan, P. R.	82	10	54	29.94	30.03	.....	79.9	+.2	90	24	84	73	5	76	13	.....	.....	...	3.87	−1.4	17	11.3	e.	28	e.	12	4	19	7	5.7	.0	.0
Panama Canal																																
Balboa Heights	118	6	92	.....	[3]29.82	.00	81.8	+1.7	92	9	88	72	17	78	17	...	...	[3]85	6.03	−2.2	15	4.9	nw.	27	nw.	16	0	13	17	7.6	.0	.0
Cristobal	36	6	97	.....	[3]29.83	−.01	82.8	+2.4	91	7	88	75	17	78	15	77	76	[3]84	14.41	+.5	23	6.7	n.	22	n.	28	0	4	26	9.1	.0	.0
Alaska																																
Fairbanks	454	11	87	29.36	[4]29.86	.....	60.1	+2.0	78	14	72	40	6	49	32	52	45	63	2.16	+.8	13	6.5	e.	24	e.	11	3	7	20	7.4	.0	.0
Juneau	80	96	116	[4]29.94	[4]30.03	.....	53.1	−1.2	74	1	59	41	11	47	28	48	44	74	6.11	+2.5	21	6.6	s.	29	e.	14	1	7	22	8.5	.0	.0
Nome	22	5	59	.....	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hawaiian Islands																																
Honolulu	38	86	100	29.96	30.00	.....	78.4	+1.8	84	10	83	71	11	74	12	70	67	70	.78	−.1	14	8.9	e.	24	e.	23	6	20	4	5.5	.0	.0

[1] Data are airport records.
[2] Barometric and hygrometric data from airport, other data city office records.
[3] Observations taken bihourly.
[4] Pressure not reduced to a mean of 24 hours.
[5] Barometric, hygrometric, and temperature records from airport, other data from city office records.
NOTE.—Except as indicated by notes, 1, and 2, data in table 2, are city office records.

SEVERE LOCAL STORMS

[Compiled by Mary O. Souder from reports submitted by Weather Bureau Officials]

The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook.]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Atwood and Beardsley, Kans., and vicinities.	1	8 p. m.	1 3		$10,000	Heavy hail	Loss in wheat and barley, in some spots, 50 percent; path 15 miles long.
Forestburg, S. Dak., vicinity of.	2	P. m.				Heavy rain and high wind.	2.85 inches of rain accompanied by high wind and light hail in a small area, washed and pounded down corn and alfalfa.
Canton, S. Dak., and vicinity	3	5-5:45 p. m.			30,000	High wind and heavy rain.	Wind, from southwest to northeast of tornadic force, accompanied by heavy rain, 3.74 inches in 45 minutes at Canton along the eastern border of the county, wrecked a dozen farm buildings in the vicinity of Canton; damaged communication lines; washed out 300 feet of railroad track between Canton and Fairview. Property damage, $30,000; crop loss from flooding in the lowlands heavy, but not estimated.
Ardmore, S. Dak., vicinity of.	3	5:15-5:30 p. m.				Heavy rain and hail.	Loss in grain and alfalfa 25 to 60 percent and about 100 percent to small fruits. Many birds, rabbits and some lambs killed; path narrow.
Sedgwick, Colo.	3	P. m.				Hail	Loss in grain crops 50 percent. Storm local covering a small area over a narrow path.
Sioux City, Iowa, and vicinities.	3-4				800,000	Heavy rain, wind, electrical.	5.10 inches at Sioux City, establishing a new record for a 24-hour period. At the airport at Sergeant Bluff, 6.32 inches fell during the same period. The Sioux City Gas & Electric Co. officially reported this to be the most destructive storm to company property of record in the Sioux City area, but an estimate was not given. This storm extended over a wide area with heavy damage in Woodbury, Monona, and Crawford Counties. Loss in young chickens, turkeys, and pigs in Plymouth County. Greatest destruction of this storm from flooding and erosion. Due to flooding in the lowlands, there was $500,000 crop loss in Monona County; in Maple Valley 80 percent, while in Willow Township, also in Woodbury County, a total loss of crops was estimated.
Hubbard Springs and Jonesville, Va.	4	5-6 p. m.	1 1		5,500	Hail	Crop loss, principally in tobacco and strawberries, $5,000; property damage, $500.
Burt, Cuming, Stanton, Madison, Thurston, Dakota, and Dixon Counties, Nebr.	4-5			5	500,000	Excessive rain and flood.	Crops destroyed; fields washed; hundreds of houses flooded and many washed from their foundations; highways, railroad tracks, and roadbeds washed out. The villages of Homer, Winnebago, and Pender wrecked.
Brandon and Venango, Nebr.	5	4 p. m.	880	0	10,000	Tornado and hail	Farmhouse completely destroyed, 3 others damaged; loss to crops from hail.
Rising City, Nebr.	5	6 p. m.	1 2	0	10,000	Tornado	No details.
McDonald, Kans., vicinity of.	5	6:15-6:30 p. m.	110-164	0	2,000	do	Farm residence and buildings destroyed; path 15 miles long.
Park, Kans.	6	1:30 a. m.		0		do	Lumber yard demolished; store and small buildings damaged.
Appleton, Wis., vicinity of.	6	8 p. m.			1,000	Thundersquall	Damage to farm buildings; many trees blown over.
Haskell County, Kans., northern portion	6	P. m.	1 2		1,500	Heavy hail	Loss chiefly in wheat; path 14 miles long.
McDowell, Va., and vicinity.	7	6-8 p. m.			500	Hail	Property damaged; loss in crops.
Palestine, Ill.	8				1,800	Wind	Property damage, $400; loss to crops, $1,500.
Jackson, Wyo.	8					Snow	Between 2 and 4 inches of snow fell in the Jackson Hole region.
North Canadian River, Okla., upper watershed	9-10				16,500	Heavy rains	Some overflow to bottomlands causing $10,000 damage to bridges and highways; $4,500 to matured crops, and $2,000 to prospective crops.
Columbia, S. C.	10	6:30 p. m.			2,700	Electrical	Property damaged.
Cattaraugus County, N. Y.	10				100,000	Thunderstorm	Torrential rains accompanying this storm washed out 7 bridges and damaged approaches of 4 others; some loss to crops.
Erie County, N. Y., southern portion.	10				15,000	Heavy rain	Damage to roads and bridges.
Roscoe, S. Dak., vicinity of.	16	1:30 a. m.	1 6		2,000	High wind	Several farm buildings demolished; trees damaged; path 15 miles long.
Syracuse, Kans., and vicinities.	16	4 p. m.	1 6		5,000	Heavy hail	Storm especially severe at Bray ranch, 5 miles west of Syracuse, where 50 sheep were killed. Large hailstones, piled 6 inches deep in places, damaged buildings and automobiles. Path 10 miles long.
Clay County, Minn., extreme southern portion.	16	7:30 p. m.	1 12		25,000	Thundersqualls and hail.	Property damaged by wind, $2,500; by hail, $2,500; crop loss from hail, $20,000; path 25 miles long.
Land O'Lakes, Wis.	17	4:15 p. m.	100	1	2,500	Tornado	Several persons injured when their home was demolished; path 5½ miles long.
Lake Tomahawk, Wis.	17	4:30 p. m.	167	1	3,500	do	Cottage blown into the lake causing the death of 1 person and injuring 3. Considerable damage to buildings.
Raceland, La., vicinity of.	17	5:10 p. m.	67	0	5,000	do	Property damaged; 1 person injured.
Gramercy, La.	17	5:30 p. m.	20	0	1,500	do	Property damaged.
Eureka, S. Dak., vicinity of.	17	6:05-6:35 p.m.	2,640			Heavy hail and high wind.	Building demolished; loss to crops not estimated; path 12 miles long.
Clark, S. Dak., southwest of.	17	9-9:30 p. m.	1 6			High wind and hail.	Loss in grain and small crops; path 12 miles long.
Minocqua, Wis., 15 miles northeast.	17		1 1			Wind and hail	Hailstones, 1 to 3 inches in circumference, damaged roofs and windows.
South-central counties, Minn., extreme portion.	17-18	10:30 p. m.-12:30 a. m.			15,000	Thundersqualls	Number of barns, outbuildings, silos, and windmills wrecked; wires down; trees uprooted; windows broken; large chimney toppled. General direc of the storm from northwest to southeast over a path 80 miles long.
Dubuque County, Iowa	18	1: 30p. m.			7,050	Hail, wind and rain.	5 barns demolished and an end torn from another. In Dubuque, many trees or large branches broken damaging automobile tops and tearing down telphone and light wires.
Johnson County, Iowa	18	5:30-6:15 p. m.			1,500	do	Principal damage from hail. $1,500 damage to windows in 2 greenhouses damage to roofs of buildings and car tops not given.
Cattaraugus County, N. Y.	18				100,000	Thunderstorm with torrential rain.	Several bridges washed out; county roads badly damaged; much loss to crops.
St. Lawrence County, N. Y.	18					do	Much loss to crops; property damaged.
Musselshell County, Mont.	20	4:15-5 p. m.		1	2,500	Wind and hail	Trees and telephone poles down; small crop loss; 2 persons injured.
Ingomar and Vananda, Mont.	20	5:30 p. m.			20,000	do	Considerable property damage; small crop loss; 1 person injured.
Brewster, Minn.	21	5:30 a. m.	2,640		2,300	Thunderstorm and hail.	Crop loss from hail, $2,000; property damage, $300.
Boone County, Iowa	22	12:05 p. m.		0		Tornado	Outbuilding on a farm damaged; a tree blown down and livestock killed on another.
Morriston, Fla.	22	2-3 p. m.	1 5-7		1,000-1,500	Heavy wind and hail.	Loss to crops; roofs blown off.
Cass County, Iowa	22	3 p. m.		0		Tornado	The storm, confined to a relatively small area, caused damage to buildings on 5 farms; 1 man injured.
Clayton County, Iowa	22	4:30 p. m.		0	7,000	Tornado and hail	No hail damage; amount estimated tornado damage to property.
Newell, S. Dak., vicinity of.	22	4:30-5 p. m.				High wind, heavy rain and hail.	Top growth of all crops destroyed; property damaged.
Red Cloud, Nebr.	22	6-8:30 p.m.	1 3		10,000	Hail	Large hailstones cause property damage of $7,000; loss from wind, $300.
Wanblee and Interior, S. Dak., and vicinities.	22	7:30 p. m.	1 2		30,000	High wind	School building wrecked; electric generator towers torn down; ranch house damaged; poultry killed; church blown from its foundation; fences and telephone lines down; small crop loss; 1 man injured.

SEVERE LOCAL STORMS—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Lyman County, S. Dak.	22	9-9:30 p.m.	[1] 12-15		1,250	High wind and heavy rain.	2.60 inches of rain recorded in 40 minutes. Between Vivian and Presho and southward, small buildings and windmills were wrecked; trees blown down and poultry killed. Interior of houses damaged by water when windows blew in; crop loss 50 percent to total loss in spots, not estimated.
Geddes, S. Dak., vicinity of	22	10-11 p.m.	[1] 3			High wind	High northwest wind damaged several buildings and flattened crops.
Walhalla, S. C.	22	P. m.			500	Electrical	Barn and contents destroyed.
Lovett, Fla., vicinity of	22					Wind and hail	Loss of 4 acres of tobacco.
Dubuque County, Iowa	22				15,000	Heavy rain	2 bridges washed out.
Lower Michigan, southern portion.	22-23			2		Thunderstorm	Unusually heavy rain and wind caused loss in crops and serious road washouts. Much wind damage reported from an area about 12 miles south of Jackson. 2 persons killed by lightning in the vicinity of Albion.
Garnett, Kans., and vicinities.	23	1:40 p. m.	17	0	5,000	Tornado	Number of houses and outbuildings damaged, especially in the 400 blocks on the eastern edge of the city and in the rural section east of Garnett. Many trees blown down; path 6 miles long.
Marion County, Ind.	23	3:05 p. m.	[1] 2		2,000	Wind	Hangar and 2 airplanes damaged.
Faith, S. Dak., and vicinity	23				6,400	Heavy rain and flood.	Rain, measuring 1.27 inches, washed out a bridge. Property damage, $400; loss to crops, $6,000.
Houma, La.	24	9 a. m.			1,500	Thunderstorm	Schoolhouse damaged.
Bartholomew County, Ind.	25	2:30 p. m.	1,760			Hail	Much loss in corn crop.
Greenville County, S. C.	25	P. m.	1,320-2,100		150,000	do	Storm came from the north and covered three-fourths of the county. Loss in fruit and crops.
Mount Carmel, Ill.	26				6,000	Wind	Property damaged.
Osmond, Nebr.	27	4 p. m.	[1] 3		30,000	Hail	No details.
Albion, Nebr.	27	5:30 p. m.	[1] 1-2		5,000	do	Do.
Stanton County, Nebr., southwestern portion.	27	6-7 p. m.	2,640		30,000	do	Property damaged from hail, $25,000; from wind, $500.
Blair, Nebr.	27	7 p. m.	[1] 2		15,000	Wind and hail	$10,000 wind damage, mostly to trees; $5,000 hail damage largely to corn and oats.
Wahoo, Nebr.	27	do	[1] 3	0	13,000	Tornado and hail	Wind damage, $5,500; hail damage, $7,500.
Taylor, Ringgold, Decatur, Wayne and Appanoose Counties, Iowa.	27	9-11 p. m.			50,000	Wind, rain and electrical.	Ringgold County reported heavy losses to buildings from fires; trees, light, and telephone wires down; much loss in fruit. In Centerville the municipal airport hangar and several barns damaged; 2 persons injured.
Kellerton, Iowa	27			0		Tornado	3 funnel clouds observed; no details.
Dunbarton, Wis.	27					Heavy hail	Much damage to corn and oats; path 6 miles long.
Castleton, Ill.	28				4,500	Wind	Property damaged.
Galva, Ill.	28				2,000	do	Do.
Woodhull, Ill.	28				500	do	Do.
Gibson, Warrick, and Vanderburg Counties, Ind.	28				5,000	do	Buildings unroofed; trees down.
Alpena, Mich.	28					Hail	Considerable damage to young shrubbery and outside greenhouse plants.
Niagara and Orleans Counties, N. Y.	30	11:30 a. m.			40,000	Heavy hail	Loss to fruit and vegetables in Niagara County, $15,000; in Orleans County, $25,000.

[1] Miles instead of yards.
[2] From press reports.

LATE REPORTS FOR MAY 1940

Seminole to Ada, Okla., and vicinities.	20	4:30-5:30 p. m.	[1] 5			Heavy hail	The town of Kowana and Bowlegs were both in the path of the storm. Traffic stopped on Highway No. 99 from Kowana to Ada. In this area hail was piled to a depth of from 6 to 8 inches on the level, and, in some places, drifts were as much as 5 feet deep. Highway graders used to remove the hail from the blocked highways. Vegetation destroyed and farms and trees presented a midwinter scene. Many animals and fowls killed. Cotton, corn, and other farm products damaged to a great extent. An estimate of the damage not given.
Sterling and Elgin, Okla., vicinity of.	20	6:30 p. m.	[1] 3-5		$30,000	do	Loss in wheat, corn, and cotton, $25,000; property damage, $5,000.
Waurika, Okla., east of	20	8-9 p. m.	[1] 12		150,000	Hail	Loss in wheat, oats, and cotton, $125,000; farm animals killed, $25,000; path 20 miles long.
Logan County, Okla.	20	P. m.	[1] 2		14,000	Heavy hail	Some property damaged; principal loss in wheat estimated at $14,000; path 12 miles long.
Verden, Okla., north and east of.	21	4:30 p. m.	200	0	25,000	Tornado	Property destroyed or damaged; loss in livestock and to many fields of grain; path 5 miles long.
Mustang, Okla.	21	P. m.	27	0	250	do	Storm dipped to the ground in 2 or 3 places, destroying a barn and causing other minor damage; path 1 mile long.

[1] Miles instead of yards.

SOLAR RADIATION AND SUNSPOT DATA FOR JUNE 1940

SOLAR RADIATION OBSERVATIONS

BY HELEN CULLINANE

Measurements of solar radiant energy received at the surface of the earth are made at nine stations maintained by the Weather Bureau, and at 10 cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Washington, D. C., Madison, Wis., Lincoln, Nebr.) and at the Blue Hill Observatory at Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau stations at Washington and Madison.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data obtained, up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Lincoln the observations are made with the Marvin pyrheliometer; at Washington, Madison, and Blue Hill they are obtained with a recording thermopile, checked by observations with a Smithsonian silver-disk pyrheliometer at Washington and Blue Hill. The table also gives vapor pressures at 7:30 a. m. and at 1:30 p. m. (75th meridian time).

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, then departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentiometer.

Direct solar radiant energy averaged considerably below normal at Washington, D. C., while at Lincoln and Madison it slightly exceeded the normal amount.

Total solar and sky radiation considerably exceeded the normal amount at Washington, Madison, Chicago, and New York, and was somewhat in excess at Lincoln. It was markedly deficient at La Jolla, Fairbanks, and Blue Hill, and somewhat so at New Orleans and Riverside.

Polarization observations made at Madison on 5 days give a mean of 70 percent, with a maximum of 71 percent on the 30th. Both of these values are slightly above the corresponding June normals.

TABLE 1.—*Solar radiation intensities during June 1940*

[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON D. C.

Date	Sun's zenith distance										
	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass									Local mean solar time
		A. M.					P. M.				
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
June 3	13.64			0.55	0.77	1.04					12.24
June 4	14.60		0.25	.37	.65						10.97
June 13	17.96				.90						16.79
June 14	15.11				.85						15.11
June 20	5.56				.90						6.50
June 21	6.50				.40						6.50
June 22	8.18				.38						8.18
Means			(0.25)	(0.46)	.69	(1.04)					
Departures			−.43	−.33	−.20	−.21					
MADISON, WIS.											
June 5	15.11	0.52	0.55	0.75	0.91						15.65
June 14	7.57		.58	.68							14.10
June 15	10.18	.75	.91	1.07	1.24	1.45					7.87
June 19	7.39	.81	.94	1.04	1.30	1.48					6.27
June 20	6.27	.91	1.03	1.14	1.31	1.53					6.27
June 21	7.87	.88	.94	1.07							7.29
June 25	10.59	.77	.90	1.04	1.16	1.47					8.48
June 27	9.83	.84	.95								8.18
June 28	13.61				1.18	1.45					9.83
June 29	8.48	.86	.98	1.11	1.30	1.47					7.87
Means		.79	.86	.99	1.20	1.48					
Departures		+.03	+.01	+.02	+.15	+.14					
LINCOLN, NEBR.											
June 1	11.38	0.65	0.78	0.93	1.14	1.43					12.24
June 8	11.38	.66	.77	.92	1.13	1.41	1.13	0.92	0.77		12.24
June 27	11.38					1.45	1.06	.77			13.13
June 29	7.04	.89	.99	1.10	1.24	1.42					8.48
Means		.73	.85	.98	1.17	1.43	(1.10)	(0.84)	(0.77)		
Departures		−.02	+.06	+.04	+.06	+.07	.00	−.07	.00		
BLUE HILL, MASS.											
June 1	13.7							0.77	0.66		14.7
June 2	12.7					1.20					12.3
June 3	13.7	0.44	0.57	0.72	0.93	1.30	0.86	.64	.48	0.38	14.3
June 4	12.8					1.08	.88	.56			9.9
June 5	15.3				.75						14.3
June 6	11.5	.56	.74	.89	1.10	1.42	1.17				6.3
June 7	7.9					1.43	1.16				7.9
June 14	6.3	.91	1.01	1.14	1.29	1.47	1.19	.99	.87	.76	6.5
June 16	7.6	.76	.84	.94	1.12	1.43	1.18	1.04			7.4
June 17	8.2				.89						8.6
June 20	6.1	.92	1.02	1.03	1.27	1.47	1.19	1.07	.94		6.1
June 21	6.5	.80	.96	1.11	1.26	1.41					6.5
June 22	6.5	.86	.99	1.10	1.26	1.42					6.5
June 23	7.4	.88	.99	1.10	1.26	1.47	1.34	1.20			5.2
June 27	11.5					1.37					8.6
June 28	10.7	.80	.93	1.09	1.12	1.38					8.6
June 30	8.8	.69	.81	.94	1.12	1.32					7.9
Means		.76	.89	1.01	1.11	1.37	1.12	.90	.74	.57	
Departures			+.01	.00	+.03	+.07	+.04	−.05	−.04		

*Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct + diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Albuquerque	Fairbanks	La Jolla	Miami	New Orleans	Riverside	Blue Hill	Newport	Friday Harbor	Ithaca	Cambridge
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
June 3	582	565	551	566	601	721	776	492	366	436	387	503	523	589	622	564	559
June 10	501	548	497	450	469	709	693	489	328	482	304	562	386	468	554	500	454
June 17	461	546	551	525	569	746	654	497	552	534	490	643	589	635	603	524	654
June 24	655	638	711	530	446	652	651	412	408	371	436	600	405	453	605	334	455
DEPARTURES FROM WEEKLY NORMALS																	
June 3	+71	+48	−2	+105	+152	+43	.....	+15	−170	−64	−74	−46	−4	+26	0	+87	.....
June 10	−3	+37	−51	−3	+18	+3	.....	−13	−207	+2	−164	−35	−116	−67	+146	+19	.....
June 17	−31	+15	−32	+49	+125	+18	.....	−16	−10	+126	+18	+36	+33	+87	+147	+45	.....
June 24	+128	+101	+106	+80	+4	−62	.....	−51	−125	−98	+40	+4	−84	−118	+156	−99	.....
ACCUMULATED DEPARTURES ON JUNE 30																	
	+413	+1,792	−1,379	+1,351	+4,683	−1,456	.....	+2,660	−5,005	+2,296	+3,964	−2,492	−3,178	−2,475	+5,992	.....	.....

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.), Superintendent, U. S. Naval Observatory.] Data from measurements at the U. S. Naval Observatory from plates obtained at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day, below longitude, latitude, area of spot or groups, and spot count, are given, respectively, the assumed longitude of the center of the disk, assumed latitude of the center of the disk, total area of spots and groups, and total spot count.

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1940	h m		°	°	°	°				
June 1	8 45	6852	−75	252	−8	76	6	1	VG	Mount Wilson.
		6851	−28	299	−7	30	6	1		
		6848	−20	307	−6	22	12	8		
		6850	−13	314	−12	18	12	5		
		6847	+39	6	−11	40	267	1		
		6845	+73	40	−12	74	388	13		
		6844	+73	40	+22	75	12	3		
				(327)	(−1)		703	32		
June 2	11 38	6856	−84	228	−15	84	145	3	F	U. S. Naval.
		6852	−62	250	−7	63	6	1		
		6854	−17	295	+5	18	24	7		
		6848	−6	306	−6	9	97	10		
		6850	+3	315	−12	12	73	3		
		6853	+51	3	+12	53	24	3		
		6847	+53	5	−11	54	339	1		
		6845	+81	33	−13	81	97	1		
				(312)	(0)		805	29		
June 3	11 14	6856	−70	229	−15	71	242	2	VG	Do.
		6855	−22	277	−20	29	170	11		
		6854	−4	295	+4	7	48	4		
		6848	+8	307	−6	10	145	13		
		6850	+16	315	−12	20	170	16		
		6853	+62	1	+12	64	97	7		
		6847	+67	6	−11	68	339	1		
				(299)	(0)		1,211	54		
June 4	11 36	6856	−57	229	−15	59	194	1	VG	Do.
		6857	−15	271	−19	24	48	7		
		6855	−9	277	−20	22	291	15		
		6851	+11	297	−8	13	12	6		
		6848	+21	307	−7	22	145	18		
		6850	+30	316	−12	32	170	13		
		6853	+75	1	+12	76	12	2		
		6847	+80	6	−11	80	339	1		
				(286)	(0)		1,211	63		
June 5	13 30	6856	−42	229	−16	45	97	1	VG	Do.
		6858	−38	233	−10	40	24	2		
		6857	−1	270	−19	19	73	16		
		6855	+4	275	−20	20	364	22		
		6848	+36	307	−7	37	48	5		
		6850	+44	315	−12	45	194	10		
				(271)	(0)		800	56		
June 6	11 4	6861	−82	178	+12	82	727	1	VG	Do.
		6860	−80	180	−7	80	194	2		
		6856	−30	230	−16	34	97	11		
		(*)	−12	248	−7	14	12	3		
		(*)	−7	253	−4	8	6	1		
		6859	−4	256	−8	10	12	4		
		6857	+12	272	−19	22	194	14		
		6855	+17	277	−20	26	388	26		
		6848	+50	310	−7	51	24	4		
		6850	+55	315	−12	56	194	11		
				(260)	(0)		1,848	77		

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1940	h m		°	°	°	°				
June 7	10 40	6860	−76	171	−8	76	194	11	VG	U. S. Naval.
		6861	−70	177	+12	71	679	1		
		6860	−68	179	−8	69	194	1		
		6856	−17	230	−16	23	73	4		
		6858	−12	235	−12	16	12	1		
		6859	+7	254	−8	11	12	4		
		6857	+25	272	−19	31	194	15		
		6862	+27	274	−12	29	48	5		
		6855	+30	277	−20	36	485	20		
		6848	+65	312	−8	66	12	2		
		6850	+69	316	−12	70	339	13		
				(247)	(0)		2,242	77		
June 8	10 51	6860	−61	172	−8	61	242	23	VG	Do.
		6861	−55	178	+13	57	485	7		
		6860	−53	180	−8	54	194	1		
		6856	−3	230	−16	16	48	1		
		6858	+1	234	−13	13	12	6		
		6859	+17	250	−8	20	48	7		
		6862	+40	273	−11	42	24	7		
		6857	+40	273	−19	44	242	27		
		6855	+45	278	−20	49	533	18		
		6850	+80	313	−12	80	48	2		
				(233)	(0)		1,876	99		
June 9	11 3	6863	−53	167	+15	55	24	7	VG	Do.
		6860	−45	175	−8	46	242	29		
		6861	−41	179	+12	42	485	1		
		6860	−39	181	−8	40	194	1		
		6865	+10	230	−10	14	6	2		
		6856	+11	231	−15	18	24	2		
		6864	+15	235	−5	16	24	2		
		6858	+16	236	−13	20	24	5		
		6862	+53	273	−10	54	48	5		
		6857	+54	274	−19	57	242	23		
		6855	+59	279	−20	61	533	12		
				(220)	(0)		1,846	89		
June 10	11 19	6863	−40	167	+16	42	12	7	VG	Do.
		6860	−31	176	−8	32	291	44		
		6866	−28	179	+8	30	12	2		
		6861	−28	179	+12	31	436	7		
		6860	−26	181	−8	27	194	1		
		6865	+23	230	−10	25	48	8		
		6856	+24	231	−15	29	16	2		
		6864	+28	235	−5	29	16	2		
		6858	+30	237	−14	33	16	5		
		6862	+65	272	−10	66	24	3		
		6857	+67	274	−19	68	194	16		
		6855	+72	279	−20	73	388	10		
				(207)	(+1)		1,647	107		
June 11	10 39	6863	−27	167	+16	30	24	4	VG	Mount Wilson.
		6867	−26	168	+24	34	24	1		
		6860	−17	177	−8	20	339	41		
		6866	−14	180	+8	15	12	2		
		6861	−13	181	+12	17	339	4		
		6860	−11	183	−8	14	194	1		
		6865	+37	231	−10	38	48	12		
		6856	+38	232	−14	41	12	2		
		6864	+42	236	−5	42	6	2		
		6858	+43	237	−14	45	6	3		
		6857	+82	276	−19	82	97	6		
		6855	+82	276	−20	82	194	2		
				(194)	(+1)		1,295	80		

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1940	h m		°	°	°	°				
June 12..	10 58	6863	−15	165	+17	23	24	2	G	Mount Wilson.
		6867	−12	168	+23	25	24	1		
		6860	−4	176	−8	11	436	35		
		6861	−2	178	+12	11	339	5		
		6860	+2	182	−8	9	194	1		
		6869	+9	189	+10	12	6	2		
		6868	+16	196	−25	30	97	7		
		6856	+51	231	−16	54	12	3		
		6865	+52	232	−11	53	24	2		
				(180)	(+1)		1,156	58		
June 13..	11 18	6870	−80	87	+4	80	24	4	VG	Do.
		6867	+1	168	+24	23	24	8		
		6863	+1	168	+16	15	48	11		
		(*)	+3	170	−3	4	12	3		
		6860	+10	177	−8	14	461	54		
		6861	+11	178	+12	15	315	16		
		6860	+15	182	−8	18	194	1		
		6868	+30	197	−25	39	291	20		
		6856	+66	233	−16	68	6	2		
		6865	+67	234	−10	68	6	1		
				(167)	(+1)		1,381	120		
June 14..	10 47	6870	−66	88	+4	66	6	1	VG	Do.
		6871	−33	121	−11	35	12	4		
		6867	+13	167	+24	26	12	6		
		6863	+15	169	+16	21	145	8		
		6861	+24	178	+12	26	145	9		
		6860	+24	178	−8	25	242	31		
		6860	+29	183	−8	30	194	1		
		6868	+39	193	−25	46	121	15		
		6868	+47	201	−24	51	194	1		
		6865	+80	234	−9	80	6	1		
				(154)	(+1)		1,077	77		
June 15..	10 50	6871	−20	121	−11	23	121	13	VG	Do.
		6873	−8	136	+16	7	6	3		
		6872	+7	148	+22	22	6	1		
		6863	+25	166	+16	29	73	11		
		6863	+31	172	+15	34	73	6		
		6860	+38	179	−8	39	145	27		
		6861	+39	180	+12	40	170	11		
		6860	+41	182	−9	42	218	6		
		6868	+52	193	−25	56	121	18		
		6868	+60	201	−24	64	291	6		
				(141)	(+1)		1,224	102		
June 16..	12 11	6874	−82	45	−11	82	485	1	G	Do.
		6871	−7	120	−11	13	97	15		
		6873	+10	138	+13	16	12	6		
		6863	+39	166	+16	41	48	7		
		6867	+40	167	+25	46	6	2		
		(*)	+40	167	+10	41	12	3		
		6863	+46	173	+15	47	48	4		
		6860	+52	179	−8	53	97	10		
		6861	+53	180	+13	55	121	6		
		6860	+56	183	−9	57	170	1		
		6860	+60	187	−11	61	48	1		
		6868	+64	191	−25	68	12	2		
		6868	+75	202	−24	77	291	4		
				(127)	(+1)		1,447	62		
June 17..	9 40	6874	−69	46	−10	69	582	4	VG	Do.
		6871	+6	121	−10	12	24	7		
		6875	+53	168	+21	56	61	14		
		6867	+54	169	+23	57	6	2		
		6863	+60	175	+15	60	48	2		
		6860	+67	182	−9	67	218	10		
		6861	+67	182	+13	67	97	7		
		6868	+88	203	−24	88	145	2		
				(115)	(+1)		1,181	48		
June 18..	8 37	6874	−56	46	−10	57	606	15	VG	Do.
		6871	+20	122	−11	23	6	4		
		6876	+37	139	−22	42	6	2		
		6875	+66	168	+22	67	73	15		
		6867	+67	169	+23	68	48	7		
		6863	+73	175	+14	73	48	4		
		6861	+77	179	+13	77	48	2		
		6860	+85	187	−9	85	194	3		
				(102)	(+1)		1,029	52		
June 19....	13 12	6878	−81	5	−10	81	48	1	F	U. S. Naval.
		6877	−77	9	−18	78	194	4		
		6874	−41	45	−10	42	679	9		
		6875	+78	164	+23	79	170	3		
		6867	+78	164	+24	79	73	2		
				(86)	(+2)		1,164	19		

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1940	h m		°	°	°	°				
June 20..	13 26	6877	−69	4	−19	70	73	4	F	U. S. Naval.
		6878	−67	6	−11	68	97	1		
		6877	−60	13	−19	62	194	3		
		6874	−27	46	−11	30	630	11		
		6879	+34	107	−5	35	12	4		
				(73)	(+2)		1,006	23		
June 21..	11 12	6877	−56	5	−19	60	145	7	VG	Do.
		6878	−55	6	−11	56	73	1		
		6877	−47	14	−18	51	291	8		
		6886	−37	24	+11	39	24	2		
		6881	−34	27	−16	38	48	8		
		6874	−14	47	−12	20	630	17		
				(61)	(+2)		1,211	43		
June 22..	10 58	6877	−42	6	−19	47	121	8	F	Do.
		6878	−41	7	−11	43	97	1		
		6877	−34	14	−18	40	339	7		
		6881	−20	28	−15	26	97	3		
		6874	−2	46	−11	13	533	7		
		6882	+8	56	+17	18	12	2		
		(*)	+13	61	−10	17	6	2		
				(48)	(+2)		1,205	30		
June 23..	12 13	6883	−73	321	−12	74	6	1	VG	Do.
		(*)	−50	344	−16	53	6	3		
		6877	−30	4	−19	36	73	10		
		6878	−28	6	−11	31	48	1		
		6877	−23	11	−18	30	436	37		
		6881	−6	28	−15	19	73	11		
		6874	+13	47	−11	19	533	12		
		6882	+23	57	+15	26	73	6		
				(34)	(+2)		1,248	81		
June 24..	12 20	6887	−74	307	+2	74	194	5	VG	Do.
		6888	−72	309	−16	75	97	6		
		6883	−59	322	−11	60	6	1		
		6886	−36	345	−13	38	48	4		
		6885	−20	1	+12	23	24	4		
		6878	−16	5	−11	21	73	2		
		6877	−10	11	−17	21	679	55		
		(*)	−5	16	−5	8	6	2		
		6881	+8	29	−15	19	54	8		
		6874	+26	47	−11	29	485	4		
		6882	+37	58	+16	39	48	6		
		6884	+68	89	+5	68	48	3		
				(21)	(+2)		1,762	100		
June 25..	9 2	6887	−62	307	+2	62	170	6	VG	Mount Wilson.
		6888	−62	307	−14	64	242	12		
		6883	−47	322	−11	49	6	1		
		6889	−41	328	+8	42	12	7		
		6886	−22	347	−13	26	24	8		
		6878	−2	7	−11	13	73	1		
		6877	+4	13	−16	19	630	23		
		6881	+22	31	−15	28	145	9		
		6874	+39	48	−11	41	436	5		
		6882	+50	59	+16	52	36	9		
		6884	+82	91	+5	82	145	9		
				(9)	(+2		1,919	90		
June 26..	12 42	6887	−48	306	+1	48	145	6	VG	U. S. Naval.
		6888	−46	308	−16	49	485	35		
		(*)	−32	322	−10	34	6	1		
		6889	−28	326	+7	29	97	14		
		6886	−7	347	−14	19	36	7		
		6885	+9	3	+15	16	12	3		
		6878	+11	5	−11	17	71	1		
		6877	+18	12	−17	26	824	25		
		6890	+20	14	−25	34	6	1		
		6881	+35	29	−16	39	133	16		
		(*)	+41	35	+7	41	6	3		
		6874	+53	47	−11	54	436	5		
				(354)	(+2)		2,257	117		
June 27..	14 12	6887	−33	307	+1	33	97	3	G	Do.
		6888	−30	310	−15	33	485	30		
		6891	−22	318	−2	22	24	1		
		6889	−13	327	+8	14	121	12		
		6878	+26	6	−11	30	61	1		
		6877	+32	12	−17	37	824	20		
		6881	+48	28	−16	51	133	9		
		6874	+67	47	−11	68	436	3		
				(340)	(+3)		2,181	79		
June 28..	11 20	6892	−48	280	−18	52	6	1	VG	Do.
		6887	−21	307	+1	21	85	4		
		6888	−18	310	−15	25	436	28		
		6891	−9	319	−2	10	12	1		
		6889	−2	326	+8	6	145	18		
		6878	+37	5	−11	40	61	1		
		6877	+45	13	−17	49	824	19		
		6881	+61	29	−16	65	133	12		
		6874	+80	48	−10	80	436	1		
				(328)	(+3)		2,138	85		

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mount Wilson group No.	Difference in longitude	Longitude	Latitude	Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1940	h m		°	°	°	°				
June 29..	11 5	6892	−34	281	−19	41	48	4	G	U. S. Naval.
		6887	−9	306	+1	10	97	8		
		6888	−5	310	−14	19	388	25		
		6891	+3	318	−2	6	24	6		
		6889	+11	326	+8	13	194	20		
		6878	+50	5	−10	52	24	2		
		6877	+58	13	−18	62	679	16		
		6881	+73	28	−16	75	194	8		
				(315)	(+3)		1,648	39		
June 30..	11 31	6892	−23	279	−20	33	12	4	F	Do.
		6887	+6	308	+1	6	73	1		
		6888	+10	312	−15	20	339	20		
		6891	+17	319	−1	19	12	6		
		(*)	+20	322	+17	24	12	3		
		6889	+25	327	+10	26	194	24		
		6878	+64	6	−10	66	24	2		
		6877	+71	13	−18	75	582	8		
				(302)	(+3)		1,248	68		

Mean daily area for 30 days=1,432

*=Not numbered. VG=very good; G=good; F=fair; P=poor.

PROVISIONAL RELATIVE SUNSPOT NUMBERS

[Dependent on observations at Zurich only. Data furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

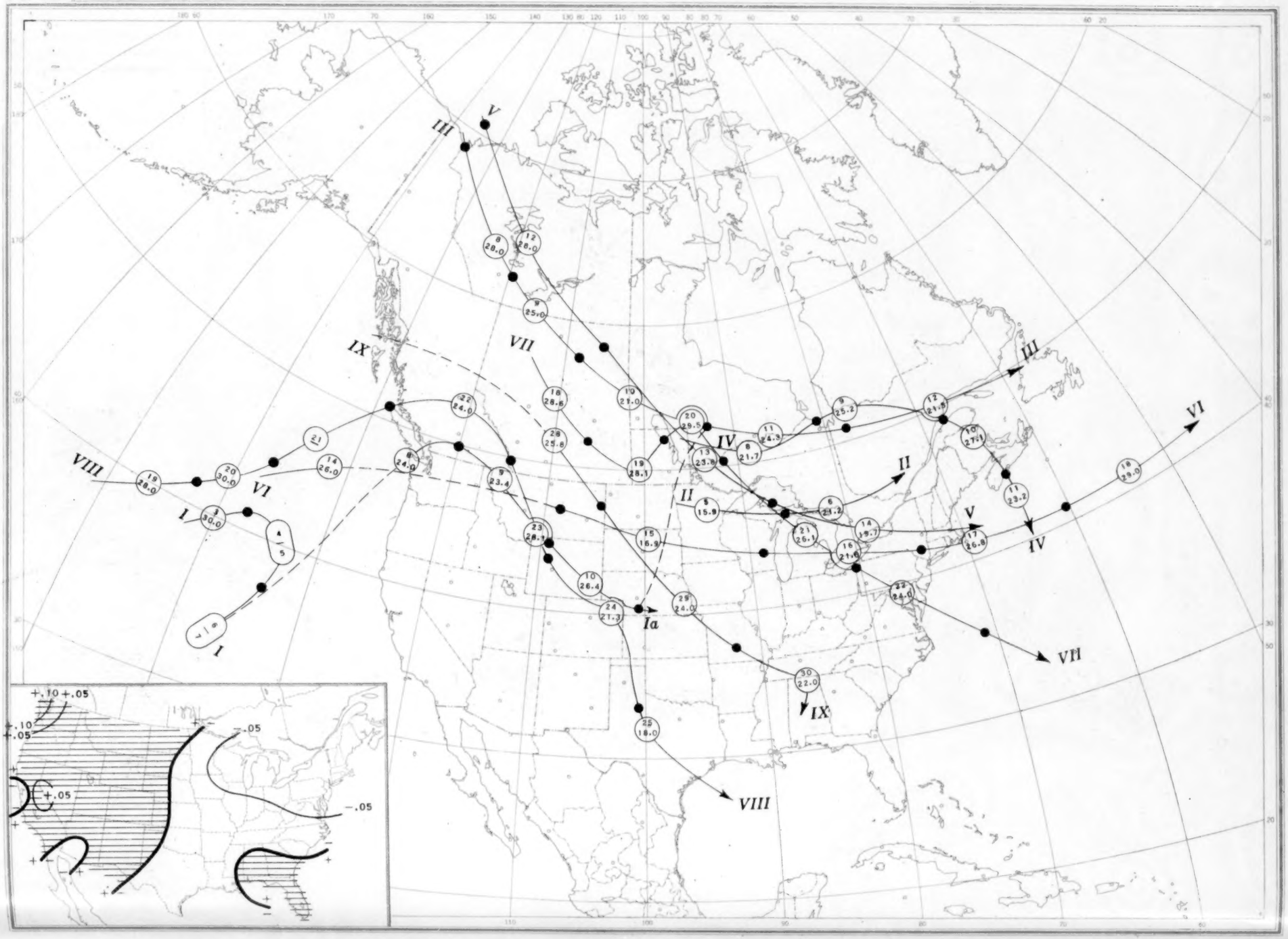
June 1940	Relative numbers	June 1940	Relative numbers	June 1940	Relative numbers
1	*Mc* 38	11	109	21	*Ec* 58
2	41	12	*Maac* 94	22	*b* 61
3	*Ecd* 77	13	104	23	83
4	80	14	*Mc* 76	24	*Ec* 113
5	*a* 58	15	82	25	*b* 108
6	*d* 95	16	*d* 59	26	*Ec* 136
7	94	17		27	117
8	106	18	51	28	*a* 120
9	102	19	*d* 46	29	*a* 104
10	107	20	38	30	103

Mean, 29 days=84.8.

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity; E, on the eastern part of the sun's disk; W, on the western part; M, in the central-circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.

Chart V. Departure (+ or −) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, June 1940

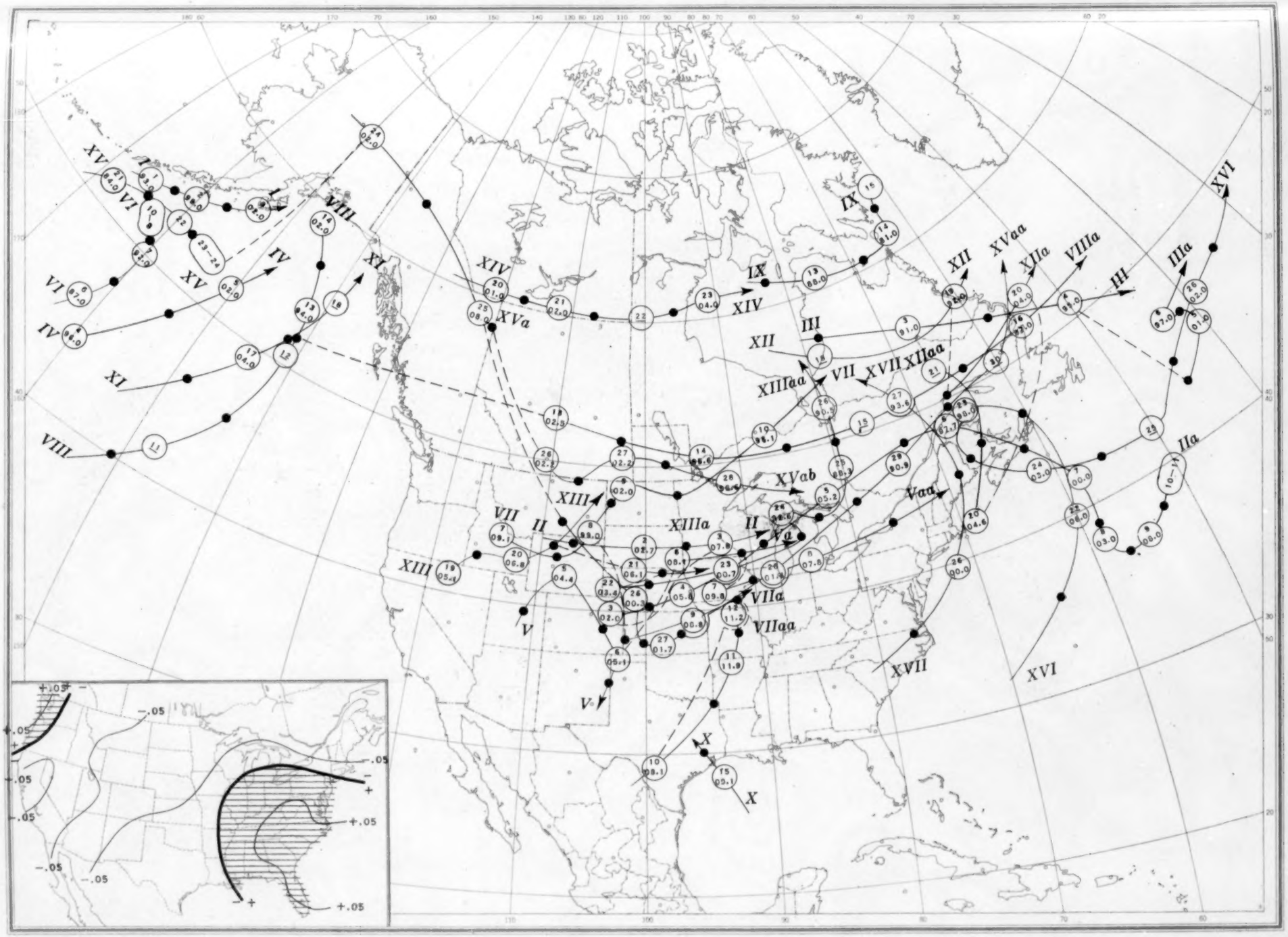
Chart II. Tracks of Centers of Anticyclones, June 1940. (Inset) Departure of Monthly Mean Pressure from Normal



Circle indicates position of anticyclone at 7:30 p. m. 75th meridian time; with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. 75th meridian time.

Chart III. Tracks of Centers of Cyclones, June 1940. (Inset) Change in Mean Pressure from Preceding Month

Chart III.—Tracks of Centers of Cyclones, June 1940. (Inset) Change in Mean Pressure from Preceding Month



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, June 1940

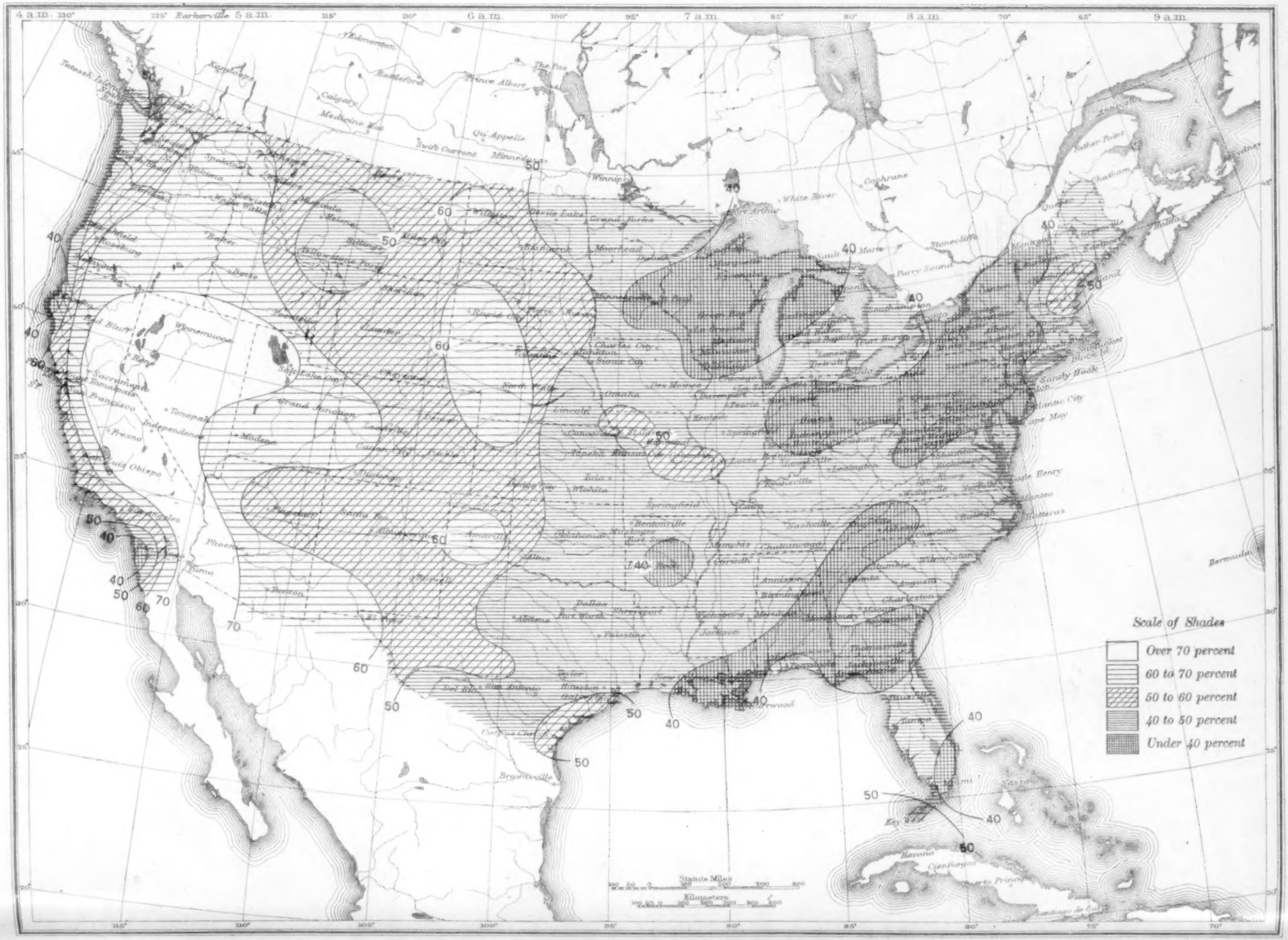


Chart V. Total Precipitation, Inches, June 1940. (Inset) Departure of Precipitation from Normal

Chart V. Total Precipitation, Inches, June 1940. (Inset) Departure of Precipitation from Normal

Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, June 1940

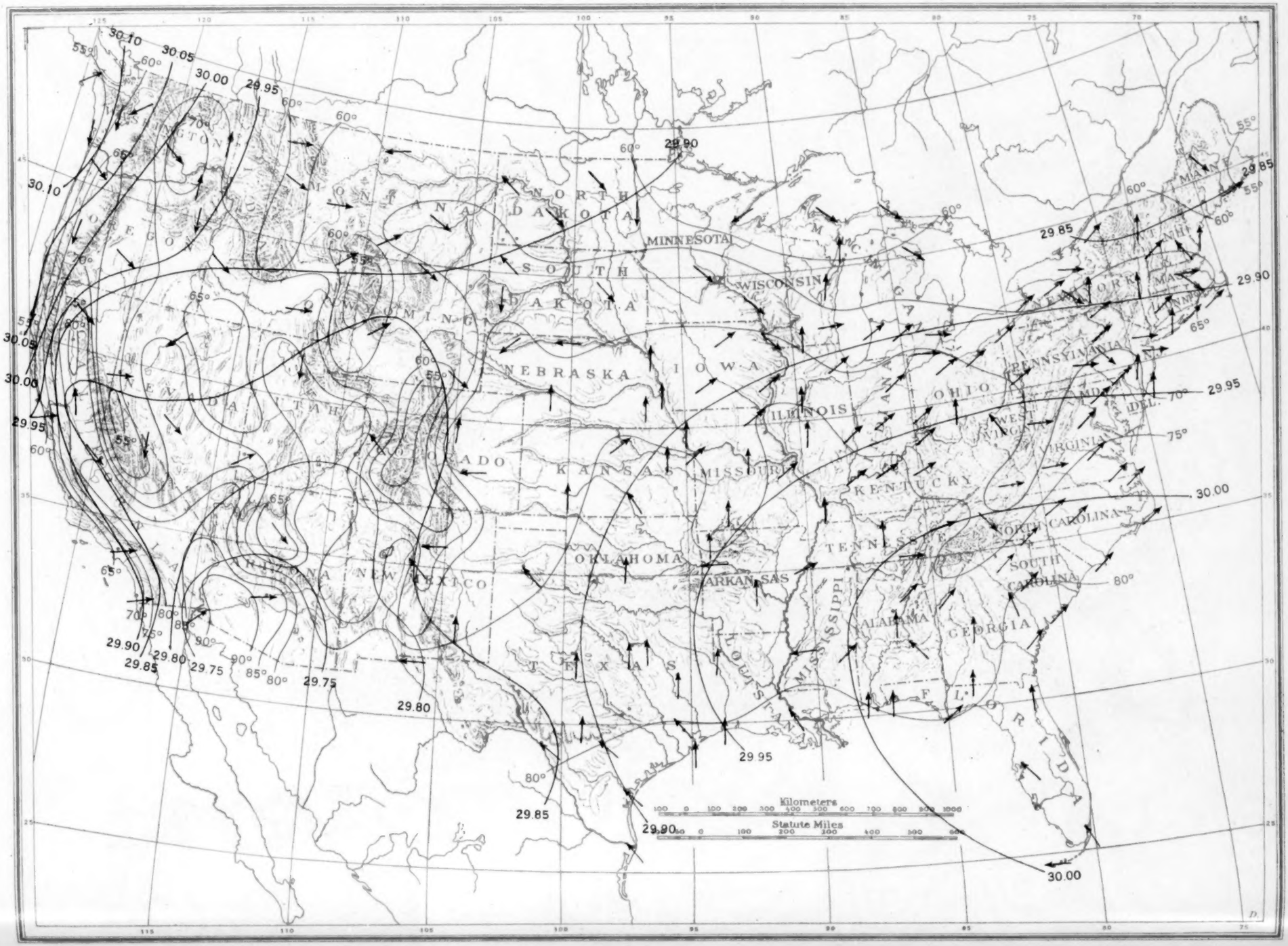


Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) June 1940

Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) June 1940

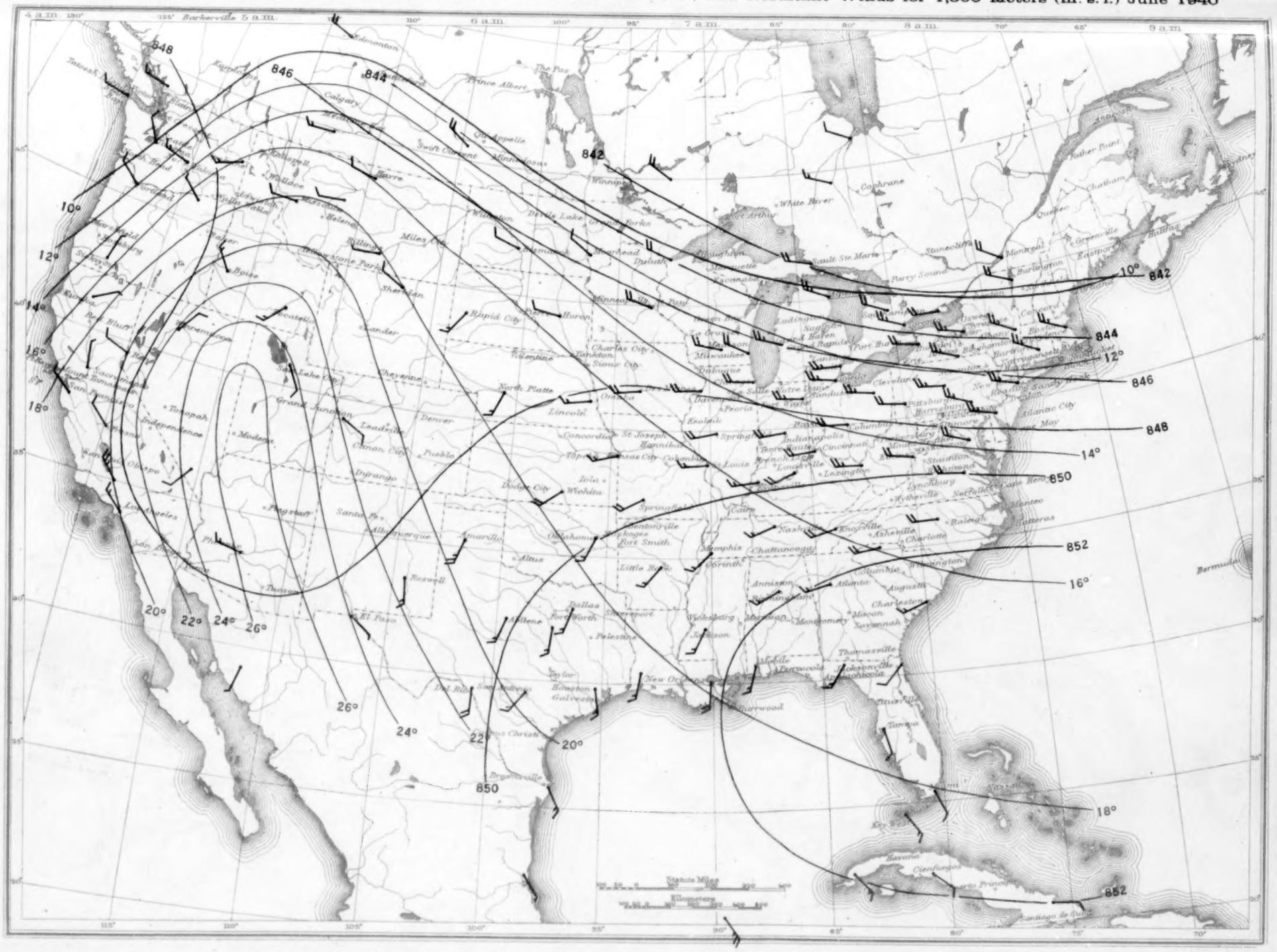


Chart IX. Isobars (mb) Isotherms (°C.) and Resultant Winds for 3,000 Meters (m. s. l.) June 1940

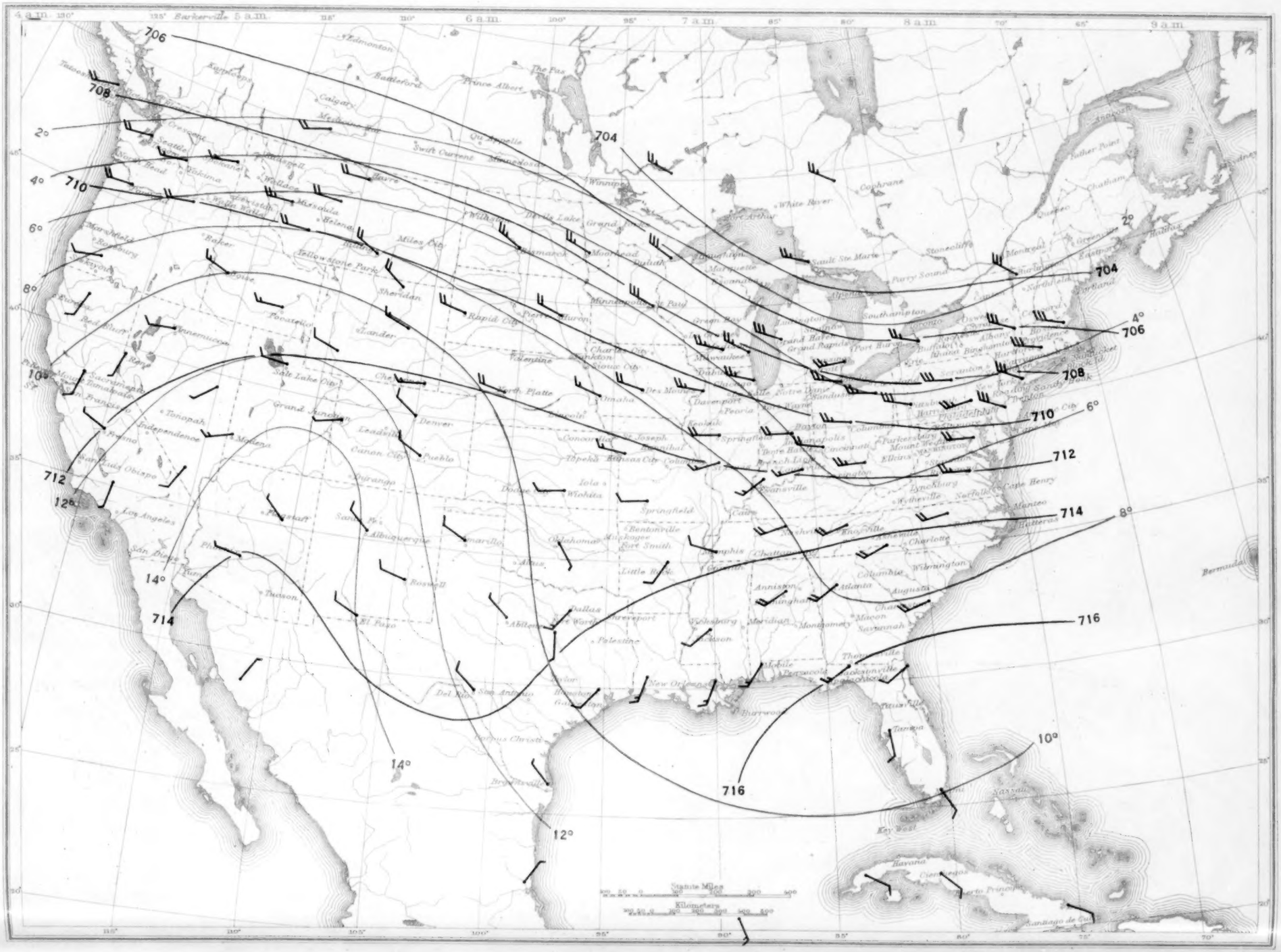


Chart X. Isobars (mb) Isotherms (°C.) and Resultant Winds for 5,000 Meters (m. s. l.) June 1940

Chart X. Isobars (mb) Isotherms (°C.) and Resultant Winds for 5,000 Meters (m. s. l.) June 1940

Chart XI. Isobars (mb) Isotherms (°C.) and Resultant Winds for 10,000 Meters (m. s. l.) June 1940

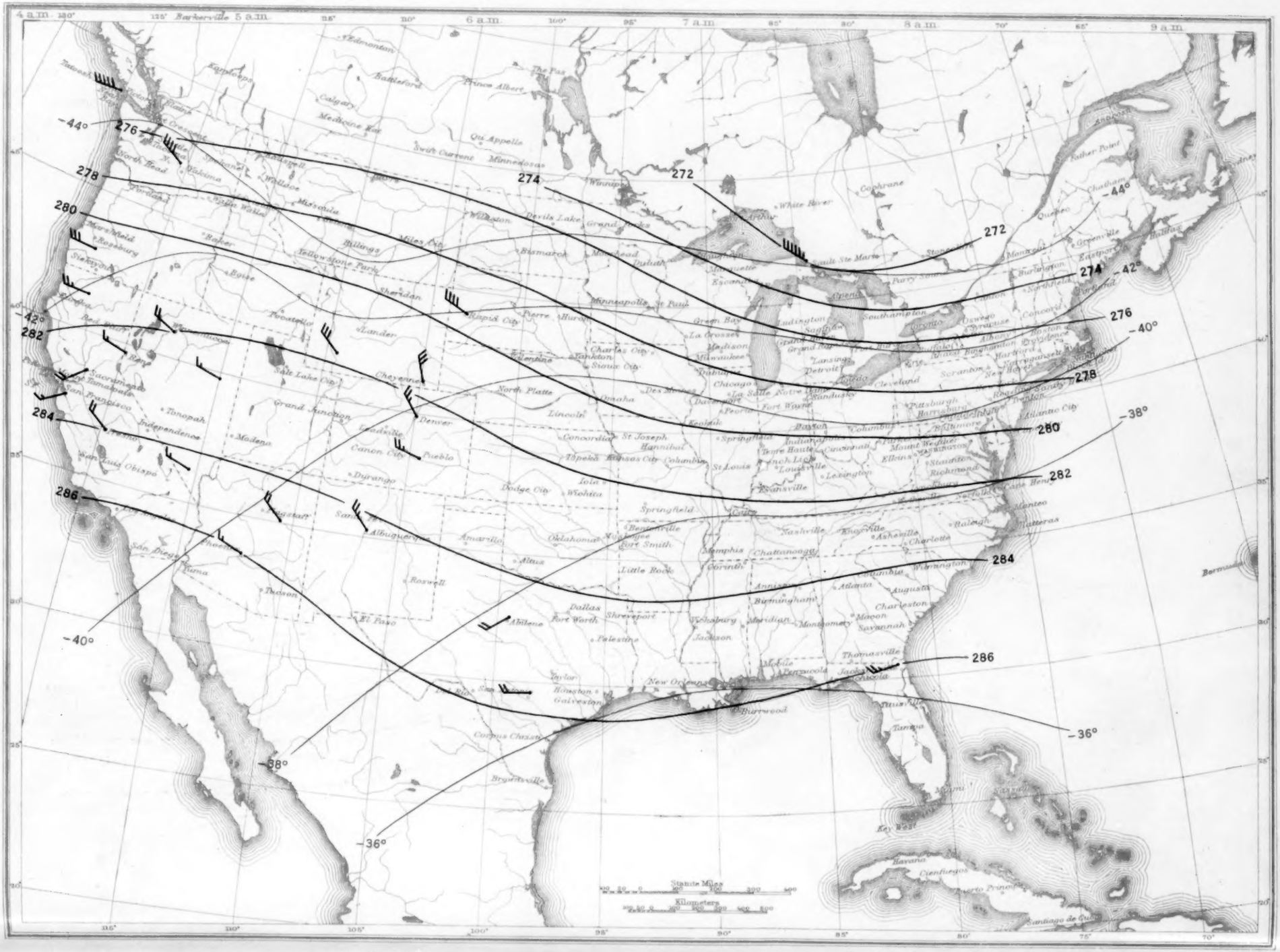


Chart XII. Mean Isentropic Chart, June 1940 (Potential Temperature 312° A.)

Chart XII. Mean Isentropic Chart, June 1940 (Potential Temperature 312° A.)

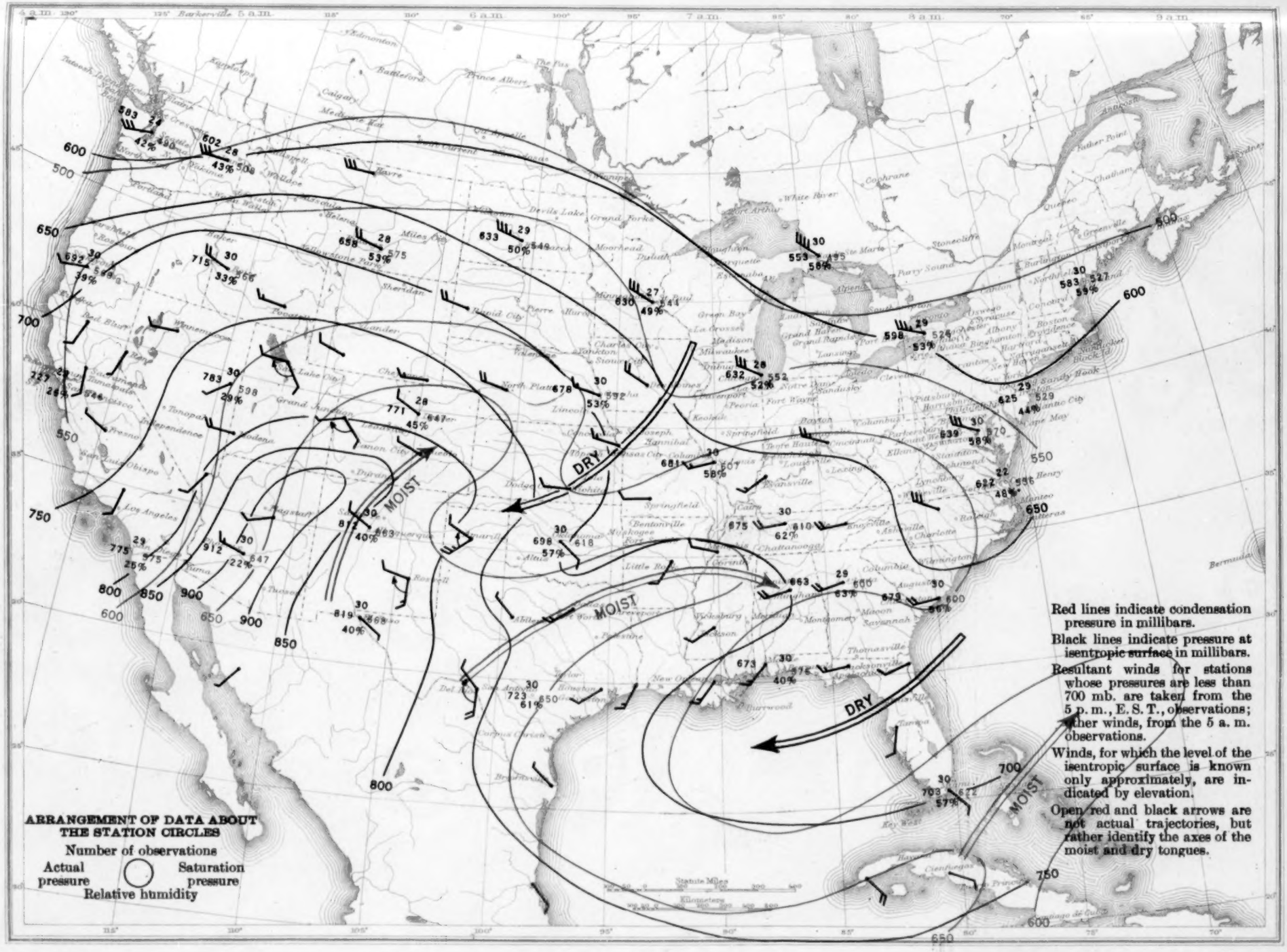

DRY
MOIST
MOIST
DRY
MOIST
ARRANGEMENT OF DATA ABOUT THE STATION CIRCLES
Number of observations
Actual pressure
Saturation pressure
Relative humidity
Red lines indicate condensation pressure in millibars.
Black lines indicate pressure at isentropic surface in millibars.
Resultant winds for stations whose pressures are less than 700 mb. are taken from the 5 p. m., E. S. T., observations; other winds, from the 5 a. m. observations.
Winds, for which the level of the isentropic surface is known only approximately, are indicated by elevation.
Open red and black arrows are not actual trajectories, but rather identify the axes of the moist and dry tongues.

Chart XIII. Mean Tropopause Data, Altitude (km.) (m. s. l.) Temperature (°C.) June 1940

(Data from table 4)